The Magazine of the Registered Professional Engineer

American Engineer

FEBRUARY 1961

ENGINEERING—
A CAREER OF
OPPORTUNITY

3 Special Features on Engineering and . . .

- **Education**
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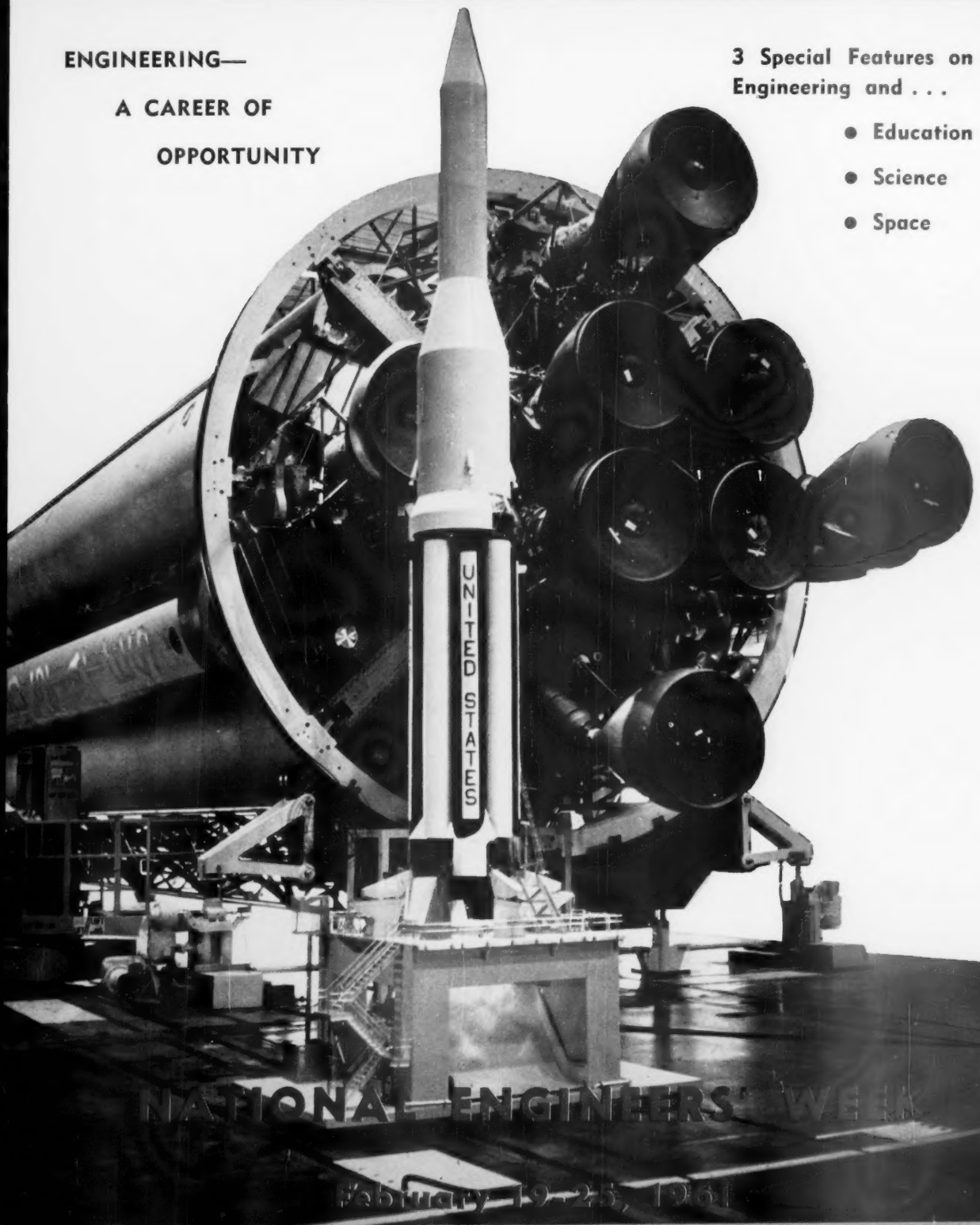
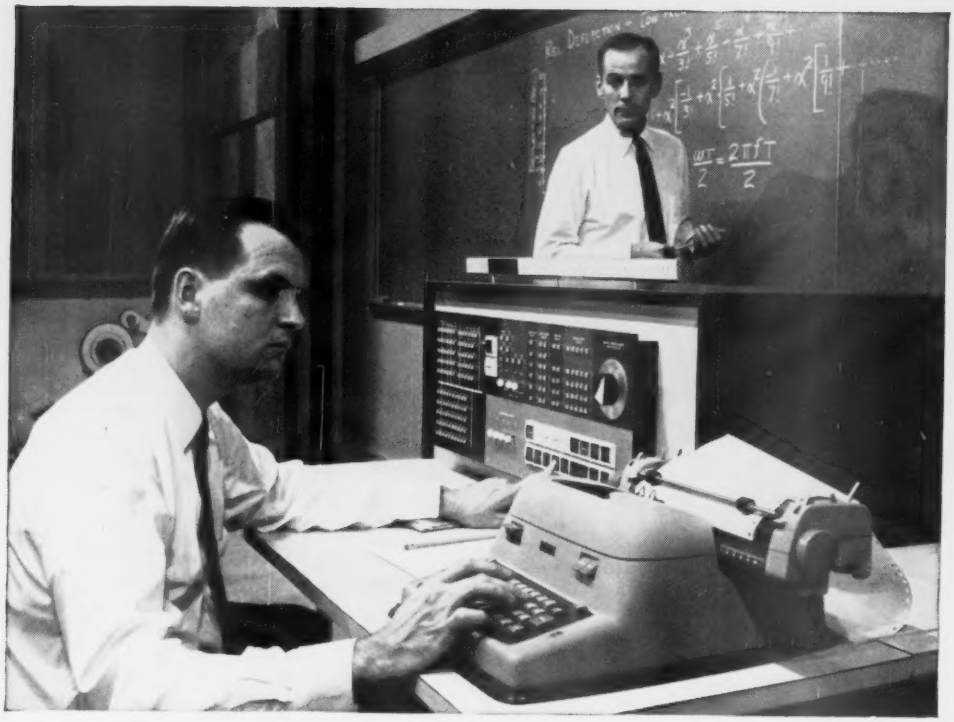


NATIONAL ENGINEERS' WEEK

February 19–25, 1961



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American Engineer

FEBRUARY 1961
Vol. 31, No. 2

NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS FOUNDED 1934

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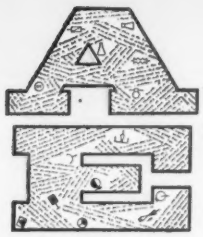


"This Month"

"This Month" is truly an engineer's month! February brings National Engineers' Week, this year beginning on the 19th. This issue of the AE is a salute to the observance and its theme, "Engineering—A Career of Opportunity." Three articles pinpoint subjects of current interest: Page 23--Huge Project Saturn signals great engineering feats in the decade ahead; Page 29—Another look at this bothersome question of "Where Does Science Stop . . . and Engineering Begin?"; Page 34—While the emphasis on engineering everywhere goes up, engineering enrollments go down. Why?

But there's more to balance out the issue. A Special Report on page 31 treats a unique Engineering Aid and Referral Bureau established by the Chicago Chapter of the ISPE. And page 38 brings us a discussion of the new Model Registration Law by NSPE head, Noah E. Hull.

Here's the latest news this February, 1961:

General. Page 12. Top items: Plans set across the U.S. for gala National Engineers' Week . . . Two largest engineering organizations in Canada to merge . . . Air Pollution Foundation to disband after spending $3½ million during seven years' work on West Coast smog problem.

Consulting. Page 14. Congress gets off to a fast start with six self-employed retirement bills being dropped in the hopper. In other stories: A Kennedy task force suggests more public works construction which could, in turn, mean business for consultants . . . NSPE's Board of Ethical Review rules that the Canons of Ethics and Rules of Professional Conduct do not apply to "subprofessional work" . . . Alaskan firm cleared of "unfair practice" charge.

Education. Page 16. The headlines: Cornell U. Revises Basic Engineering Course . . . Summer Course Planned in Process Control Theory . . . High Casualty Rate Noted in Engineering Students . . . Arizona Engineers Make Study of Sandwich Shells.

Industry. Page 18. The lead stories: The demand for engineers and scientists dipped in August, 1960, rose through October, and then receded again as the year closed . . . the engineers' union, ESA, folds after eight years . . . The National Science Foundation reports that more engineers than ever now work in industry.

Government. Page 20. Story #1: The New York SSPE continues its battle to protect engineers employed by the City of New York from unionization attempts. Story #2: Long-time Missouri highway official, Rex M. Whitton, becomes new Federal Highway Administrator.

And don't forget to take part in your local National Engineers' Week program, February 19-25.

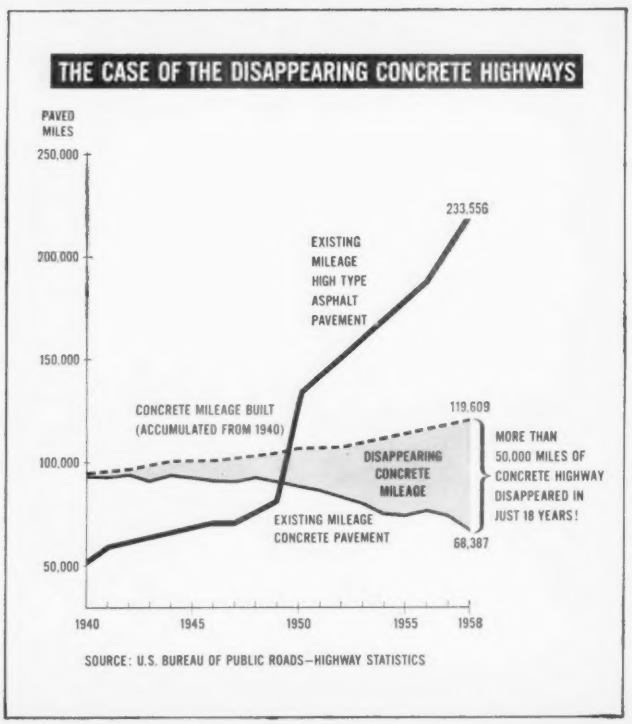
Kenneth E. Trombley
Editor

ASPHALT presents the case of—

The Disappearing

Thousands of miles of expensive concrete roads have disappeared from view in the last 18 years. Most of these roads have had to be covered over with Asphalt paving to restore a satisfactory level of riding safety and comfort. How much better it would have been to use total Asphalt construction in the first place! Many millions in tax dollars would have been saved due to the more economical construction and lower maintenance costs of Deep Strength Asphalt pavements.

Concrete surfaced highways are actually disappearing from the records of the U.S. Bureau of Public Roads faster than they're being built. As this graph shows, from 1940 to 1958, despite the fact that more than 30,000 new miles of concrete roads were con-



EXPLANATION: Figures represent total mileages of high type Asphalt and concrete pavements built by State Highway Departments on state primary systems; municipal extensions to state primary systems and secondary and local roads built by State Highway Departments. See U.S. Bureau of Public Roads HIGHWAY STATISTICS—SUMMARY TO 1955 —table SMB-201 and tables SMB-2, 1956 to 1958 inclusive.

CONCRETE Highways!

structed, *total* concrete mileage *decreased* by over 50,000 miles. This is a decline in concrete mileage 9,000 miles greater than the entire new Interstate Highway System now being built.

During the same period, according to the Bureau of Public Roads records, high type Asphalt-paved mileage increased over 180 thousand miles. And today, over 90% of America's paved roads are Asphalt-surfaced.

One of the reasons for this is that each year the nation's petroleum industry invests over 4 million dollars in engineering research to keep Asphalt pavement the safest, most durable, economical pavement available.

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Deep Strength Asphalt pavement can mean more miles of better roads for your tax dollar. To get the facts, read the new booklet, THE BETTER WAY TO BETTER ROADS. For your free copy, write The Asphalt Institute.

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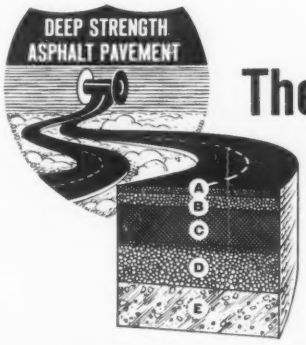

The **ASPHALT INSTITUTE**

College Park, Maryland

(Circle 2 in Readers' Service Department)

Letters to the Editor

SSS Upheld . . .

Dear Editor:

The December, 1960, issue of AMERICAN ENGINEER contains an article entitled, "U.S. Selective Service Compared to USSR," which I consider to be quite misleading and which requires clarification or correction.

All persons entering the U.S. Army are interviewed at Classification and Assignment Centers for the purpose of effectively determining their future utilization. At the time of my induction in January, 1953, I had occasion to work as an interviewer at C & A before receiving my assignment. Qualified engineers and scientists were incorporated into the Scientific and Professional Personnel Program. Metallurgy was my field of specialization and I was assigned to the Pitman-Dunn Laboratories at Frankford Arsenal. None of the scores of other engineers whom I met in the program likened our duties to "trench warfare."

The suggestion of placing engineers and scientists in civilian or military service at the discretion of local Selective Service Boards as suggested in the article is impractical to the point of being ridiculous. Local boards do not have the knowledge for utilizing such varied and highly skilled talent; they are of necessity limited in their knowledge of this country's national or international needs; and while patronage is not common, local boards could be more readily influenced than the present system allows.

I spent my two years of service in the comforts of Philadelphia while my companions of basic training were shooting it out in Korea. What else would the author ask for? It still remains that the engineer has the same responsibilities as his fellow citizen and that he is not entitled to the privileges of any caste system.

The article in question smacks of unwarranted criticism of the policies of the U.S. Army and of the Selective Service System.

ANTONI TABAK,
P.E.,
Melrose, Mass.

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N. J. Fines . . .

Dear Editor:

Reference is made to Wayne E. Ault's letter to the editor in the November issue of AMERICAN ENGINEER regarding a fine imposed by the New Jersey State Board of Professional Engineers and Land Surveyors on the "Automatic" Sprinkler Corporation of America of which Mr. Ault is manager of engineering.

In closing, Mr. Ault hoped that others would express their opinions on "where the drawing requires the seal of a registered professional engineer." I am expressing my opinion as an individual member of NSPE and also as a very concerned member of the Ohio State Chapter of which Mr. Ault is president. I certainly hope that the New Jersey State Board will present its side of this controversy and that the OSPE Trustees and individuals high in OSPE and NSPE will give their views and not sit idly by "looking the other way."

It would seem that the New Jersey Board erred in not inviting the "Automatic" Sprinkler Corp. to the hearing on its case. Mr. Ault, however, states that his company is not concerned about the Board's authority to impose penalties or method of determining the facts in their case but only in the question of when a drawing requires the seal of a registered professional engineer.

I am confident that the New Jersey Board did not act impulsively in this case but only after thorough consideration of the facts. It must have had a very definite reason for its decision to fine the "Automatic" Sprinkler Corp. for violation of Statute 45:8. Indeed, the very foundations of NSPE are based on the right of the State Boards of Registration to impose fines for violation of their statutes or to even revoke licenses, if necessary, in order to enforce these statutes. Without these enforcement powers we might just as well disband NSPE and engineering registration altogether.

I don't think any state board, NSPE, or any state chapter questions the use of technicians by engineers or industries for the preparation of engineering drawings under the supervision of a registered professional engineer. However, from Mr. Ault's letter it would appear that his company believes that, other than for exceptional cases, the fabrication and installation of fire protection systems does not require the services or supervision of a registered professional engineer. I beg to differ most emphatically with Mr. Ault. In most instances lives and safety of individuals will be dependent upon the proper functioning of the fire protection systems installed by his company. Thus, the work definitely falls under a category where a state board of registration would require that the fabrication drawings be sealed or approved by a registered professional engineer or that the installation be supervised by one.

In my experience in the consulting field, I have come across few technicians with only a high school education who would be capable of the responsibility required to interpret the regulations of the National Board of Fire Underwriters or to intelligently and competently consult with an in-

(Continued on Page 55)

John F. Kennedy

President of the United States

...Considers Engineering

"Let both sides seek to invoke the wonders of science instead of its terrors. Together let us explore the stars, conquer the desert, eradicate disease, tap the ocean depths and encourage the arts and commerce."

Inaugural Address, January 20

"We must step up crash programs to provide ourselves with the ultimate weapons—the Polaris submarines and the Minuteman missiles—which will eventually close the missile gap."

New York, N.Y., Sept. 14

"We shall reorganize the space program to achieve both efficiency and speedy execution. We shall bring top scientists into positions of responsibility. We shall undertake long term basic research in space science and propulsion."

Democratic Party Platform, June 12

NATIONAL ENGINEERS' WEEK
ENGINEERING . . . A CAREER OF OPPORTUNITY
FEB. 19-25, 1961

Planning Is Completed as Engineers' Week Approaches

The eleventh annual observance of National Engineers' Week will be held throughout the Nation during the week of February 19-25.

The 1961 program will be the eleventh consecutive observance under the general sponsorship of NSPE. Local chapter and state society projects will include career conferences for high school students, guided tours of industrial firms and research facilities, the awarding of scholarships, radio and TV panel discussions, exhibits, and talks before civic and educational groups by professional engineers.

The theme for the 1961 Week is "Engineering . . . A Career of Opportunity." Promotional material distributed by NSPE at the national level emphasizes the contributions made by the engineering profession to our contemporary civilization.

National chairman for the 1961 observance is Warren C. Stadden, of Roselle, N.J., a consulting engineer and architect. Fourteen leading engineering figures are acting as individual sponsors for the event.

All state society and local Engineers' Week committee chairmen are reminded that complete reports on their chapter activities should be sent to the National Society office as soon as possible. These reports are reviewed by the National Engineers' Week Committee as a source of ideas for the next year's program.

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Canadian Engineers Plan Professional Organization

Following better than a year of planning and study, the Engineers' Confederation Commission of Canada has nearly completed plans for the joining of two organizations of engineers into one national professional society which will unite the engineering profession throughout Canada.

The new organization, to be called the Canadian Institute of Professional Engineers, will combine the existing Canadian Council of Professional Engineers and the Engineering Institute of Canada. Full membership in the new Institute will be granted only to registered professional engineers, but there will exist five grades of membership which are as follows: Fellow—a registered professional engineer who has made outstanding contributions to the profession; Member—any P.E. in Canada; Junior—engineers-in-training; Student; and Honorary membership for a limited number of persons outside the profession but allied with it who make a contribution to the field in some way.

The constitution and bylaws of the body will be adopted from those of the two existing organizations involved. Among the plans which are now definite are decisions concerning the charter, objectives, name, membership, management, branches and student chapters. Many of the smaller details remain undecided.

The plans as thus completed were begun in October, 1959, when the Engineers' Confederation Commission became operative. Since that time the 25 members have met 68 times, traveled some 300,000 miles, and spent about 8,000 man-hours in their study and planning.

The commission hopes to have most of the details completed in time for the February annual meetings of the Engineering Institute of Canada and the Canadian Council of Professional Engineers.

Better Use of Engineers Urged by Industrialist

More efficient utilization of engineering personnel is the challenge of the future, Carl P. Spaulding, president of Datex Corporation, Monrovia, Calif., told a mid-year meeting of the Scientific Apparatus Makers Association in Colorado Springs, Colo., recently.

In a discussion of anticipated changes in marketing procedures over the next five years, he predicted that the shortage of engineering talent and economic growth will accelerate the movement to have more of the planning and designing of instrumentation and control systems done by specialist system design firms.

While demand for engineers is

increasing, the supply is actually decreasing, he said. He pointed out that supply of trained engineers is not keeping up with growth of other economic factors. Additionally, productivity must increase because a larger portion of the population is becoming nonproductive. Only engineering developments can supply this increased productivity.

All these factors mean that systems engineering firms face a challenge in evolving organizational, marketing and product policies that will utilize this limited supply of manpower in the most efficient manner. He predicted an increase in the price of engineering services, and that a change may be made for the engineering sales proposals. He foresees computer techniques used in proposal preparation to help proposal writers supplement their memories with mechanized information retrieval systems.

Air Pollution Foundation Plans 1961 Liquidation

Grants of $60,000 in cash and equipment valued at $45,000, to be used for further air pollution research, were made by the independent Air Pollution Foundation recently in announcing plans for its liquidation during 1961.

The announcement was made by Dr. Fred D. Fagg, Jr., president of the Board of Trustees, and Dr. W. L. Faith, managing director. Faith said the Foundation "will have fulfilled its mission by early 1961," and will be able to dissolve on schedule as predicted last November in the Foundation's 1959 Annual Report to trustees and contributors.

The Foundation granted $50,000 cash to Stanford Research Institute, together with an estimated $40,000 worth of equipment now being used in SRI's South Pasadena facility, for continued research in atmospheric chemistry.

A cash grant of $10,000 was made to University of Southern California for studies on air pollution, and equipment valued at $5,000 was turned over to Southwest Research Institute, San Antonio, Texas, for continued studies on automobile exhaust.

Upon final dissolution of the Foundation, on or about May 31, all remaining assets will be donated to Caltech for additional research work in the field of air pollution. Faith said it is impossible to estimate the probable value of the residue assets at this time.

The Foundation was organized in 1953 by 200 civic leaders to determine the nature of Southern California's smog and the methods by which it could be eliminated. It was incorporated under California state law as a private, nonprofit, scientific research organization, and was set up to be self-liquidating upon accomplishment of its purpose.

Actual work was started in 1954. By the time it disbands, the Foundation will have spent nearly $3,500,000 in its seven years' work on the smog problem. Its fact finding program has been financed by the contributions of industrial, business, financial and professional firms, trade associations, and private citizens.

"By the time the Foundation closes its doors," Faith said, "all the basic scientific research will be completed, and the technical reports published, to enable engineering to carry out its function of constantly improving, year by year, the efficiency of present day prototypes of auto exhaust control devices that will eventually make Los Angeles-type smog only a memory."

Astronauts to Try Out Space in New Simulator

A large tank-shaped device has recently been installed at Cape Canaveral, Fla., to get U. S. astronauts accustomed to living in space. Project Mercury, a high altitude simulator devised by Tenney Engineering, Inc., can create the atmosphere of altitudes up to 225,000 feet, or roughtly 45 miles.

In its main, kettle-like section, which is 12 feet in diameter and 15 feet high, the simulator will accommodate the capsule in which the first American space man is expected to soar into orbit.

The Mercury capsule and its passenger are lowered into the main chamber of the simulator. Adjacent to the main section is an ante-room for observers which can be used as a safety lock.

Inside the capsule in the simulator the astronaut is cut off from the world except for oxygen lines, an intercom system and a variety of test control signal conductors.

The astronaut's reactions in the simulated void can be viewed by doctors and others through windows and ports in the high altitude chamber. The simulator's vacuum system will provide dive rates of up to 50,000 feet a minute, but in an emergency, the chamber will be able to reach sea level from 225,000 feet in six seconds.

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(Circle 5 in Readers' Service Dept.)

Club for Boy Scouts Will Study 'Fuelless' Rocket

A group of engineers with a Minneapolis, Minn., concern recently formed a "fuel-less" rocket club with a number of Boy Scouts in the area.

Youngsters interested in space are able to conduct safe experiments under the supervision of the engineers with the use of a nonexplosive propellant. Conventional fuels in the hands of amateurs have been known to explode causing serious injury during such experiments.

Oklahoma Section ASCE Elects Poppino 1961 Head

The Oklahoma Section of the American Society of Civil Engineers has elected Allen G. Poppino, chief structural engineer for Benham Engineering Company, Oklahoma City, as their new president.

The group elected officers at their annual meeting recently in Stillwater, Okla. Also elected was Joseph E. Perry, U. S. Corps of Engineers, vice president. James W. Gillespie, Oklahoma State University faculty member, continues as secretary-treasurer.

Six Self-employed Retirement Bills Seen in Early Congress

The drive to achieve tax equality for the self-employed has gotten off to a fast start as no less than six self-employed retirement bills were introduced in the two houses of Congress during the first week of the session.

Chief House sponsor is once again Representative Keogh of New York, whose bill carries the now-familiar H.R. 10 designation. The Keogh bill is a simplified version of the approach favored by the Senate Finance Committee last year, although it contains modifications to many of the features which the Representative found objectionable. The bill would permit a self-employed person to annually deduct ten per cent of his self-employed earnings, or $2,500, whichever is less, provided he establishes a similar nondiscriminatory retirement plan for his employees. In addition a self-employed person may exceed this 10-per-cent-$2,500 limitation on deductible contributions provided that the percentage of income vested in employees' retirement funds is no less than his own, and provided that he contributes twice the dollar amount for his employees that he does for himself. As a new feature this year the bill provides that the plan for employees is not required unless the self-employed person has more than three employees, and they need not be covered until employed more than three years.

Other House bills encouraging self-employed retirement plans are those introduced by Representatives Libonati (H.R. 149), McDonough (H.R. 736) and Schwengel (H.R. 229).

Leader of self-employed retirement legislation in the Senate, and the first to introduce a bill this year, is Senator George Smathers of Florida. The Smathers bill, S. 59, is reported to be similar in principle to the Keogh measure, except that it contains the so-called Long amendment, which first made its appearance late in the 86th Congress. The Long amendment would limit the self-employed's deductible figure to one-half the amount actually contributed to the retirement program. The maximum annual contribution for which a one-half deduction can be taken is $5,000 or 20 per cent of self-employed income, whichever is less. Under this plan, a self-employed individual would have to invest $5,000 or 20 per cent of his income in a retirement fund in order to deduct half of that amount for tax purposes. The Smathers bill, like H.R. 10, would also require the self-employed to establish nondiscriminatory retirement plans for their employees as a condition to setting up programs for themselves.

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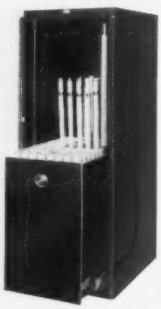

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Task Force Suggests More Public Works Construction

A special task force appointed by President Kennedy has recommended substantial increases in almost all phases of Federal public works construction as an immediate step to invigorate a lagging economy.

Headed by Dr. Paul A. Samuelson, professor of economics at M.I.T., the group said that the economy is definitely in a recession, and that it will get worse before it gets better. To get the economy rolling again, the task force called for increased Federal expenditures for school construction, urban renewal programs including slum clearance and improvement of transportation facilities, hospital construction and medical research, water resource development, and highway, post office, public building, and military construction.

In addition to direct Federal spending, the group pointed out that, "The last two recessions were helped immensely by a successful program to make credit more available to residential housing," and gave particular emphasis to reducing interest rates on loans for home modernization. The current slump in residential construction, said the group, has its roots in the depression of the 1930's when birthrates were low, causing a corresponding drop in present demand for housing as these "thin" age groups reach home-buying age. "Nevertheless," pointed out the report, "so great will be the need for housing a few years from now when the wartime babies move into the house-buying brackets and so useful is the stimulation that a resurgence of housing could bring that it would

seem folly not to make a determined effort in this area." The group admitted, however, that the Federal Government would have to use care in reducing interest rates to prevent U.S. capital from going abroad in search of higher rates, thus increasing the outflow of U.S. gold.

Subprofessional Work Is Not Under 'Canons,' 'Rules'

According to a recent decision of the Board of Ethical Review, the Canons of Ethics and Rules of Professional Conduct do not apply to subprofessional services performed by professional engineers.

In the hypothetical case discussed by the Board, an engineering firm, in which all the principals are professional engineers but which occasionally performs services of a subprofessional nature, was invited to submit a written bid for work comprised solely of subprofessional services. The question was not whether such a bid would violate Section 49 of the Canons of Ethics which forbids competitive bidding, but whether or not the Canons are even applicable in the case of subprofessional or nonprofessional services.

In making its determination, the Board considered two sections of the Canons of Ethics. Section 2 states, ". . . and he will avoid all conduct or practice likely to discredit or do injury to the dignity and honor of his profession." Section 19 says, "The engineer will endeavor to protect the engineering profession collectively and individually from misrepresentation and misunderstanding."

"It is clear," ruled the Board, "that the Canons of Ethics and Rules of Professional Conduct are intended to apply only to professional engineering practice, and not to business activities in which a professional engineer may engage, either as his sole activity or in conjunction with his engineering practice."

In making this decision, the Board stressed that care must be taken to ensure that clients and the public understand the distinction between the two categories of services. "It is desirable where the subprofessional work is a large part of the firm's activities, to operate through a separate form of organization, with a distinct name. Where this is not practicable . . . the engineer should adopt other means to segregate the types of work, including references in the contract or in correspondence."

Alaskan Firm Not Guilty of Unfair Practice Charge

A Fairbanks, Alaska firm engaging in engineering, architecture, and land surveying has been held not guilty of an unfair labor practice charge in refusing to bargain with a union representing less than a majority of their surveyors.

A three-man panel of the National Labor Relations Board upheld union charges that the firm had violated the Taft-Hartley Act when it fired two employees for union activity, but also held that the firm was within its rights in refusing to bargain with their union.

In its examination of the case, the Board found great flexibility in work assignment in the firm, and learned that employees typically performed several functions, only one of which was surveying. At the time of the dispute, the firm employed seven men who worked occasionally as members of the survey crews. In view of the fact that the union had sought to bargain for only two of these, the NLRB ruled in accordance with established procedure that the firm was not required to recognize a union representing less than a majority of the appropriate unit of surveyors. *(Gray, Rogers, Graham & Osborne, 129 NLRB No. 52, October 29, 1960.)*

President Kennedy Names Weisner to Science Post

Jerome B. Weisner, professor of engineering and director of the research laboratory of electronics at Massachusetts Institute of Technology, was recently chosen by President Kennedy to be special assistant for science in the new administration. An expert in his field at 45, his past record shows him well prepared to step into the new field of scientist-statesman.

Weisner, who received each of his three degrees from the University of Michigan, joined MIT's radiation laboratory staff in 1942, later becoming project engineer of a key radar development program and a member of the laboratory's steering committee.

After working for a year in Los Alamos with the staff working on atomic bomb research, he returned to MIT as assistant professor of electrical engineering. After becoming full professor in 1950, he stepped into his position as director of the electronics laboratory in 1952. As a leader in the development of communications sciences, he is chairman of the MIT steering committee in that field.

He served as a member of the President's Science Advisory in the Eisenhower Administration and was a member of the committee which prepared the Gaither Report, evaluating Russian power.

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Cornell University Revises Basic Engineering Course

All students entering the Cornell University College of Engineering in the fall of 1961 will be enrolled in a new Division of Basic Studies that will provide freshmen and sophomores with a program common to all engineering fields.

Continuing evaluation and development of the basic curriculum will be carried on by the Division in the future and coordination with upperclass programs, administrative procedures and operation of advising and counseling systems will be changed whenever necessery to keep abreast of the times.

Prof. Dale R. Corson, dean of the College of Engineering, Cornell, said, "A primary purpose of the change is to provide maximum opportunity for the student to become familiar with the range of professional programs available to him in the last three years of study in Cornell's five-year engineering program."

The student will be able to express a preference for one of the major fields on admission or during the following two years so that he can be assigned to appropriate advisers. He will not be committed to a particular field of engineering at the time of admission.

"A student's preference should be based," Dean Corson said, "on a sound knowledge of the engineering fields and how they differ; future outlooks of the various engineering fields; the broad range of opportunities provided by each engineering field; a better picture of the relationship of science and engineering, and the student's own inclinations and aptitudes." The basic course is planned to give students this understanding.

CORRECTION

Attention is directed to the chart used on page 28 of the January, 1961, issue of AE. No asterisk should have appeared after the words, "2-4 Plan Adopted." The note beneath the chart should have stated, "Statistical data presented in the table represent the best available information and cover the period from 1959-60." Further, this table did not appear in a paper presented by J. E. McKee as stated in the magazine but was first published in the *Journal of Engineering Education*, November, 1950, in a paper entitled "A New Approach to the Doctors Degree for Engineers," written by D. H. Pletta, head of the Department of Engineering Mechanics, Virginia Polytechnic Institute.

Summer Course Planned in Process Control Theory

An intensive three-week summer study course in Process Control Theory will be offered at Case Institute of Technology for practicing engineers who require training in the most modern techniques of the automatic control field, July 10-29, 1961.

The course will include many of the new concepts of automatic control with theory and applications based on modern developments in instrumentation components and systems.

Dr. Donald P. Eckman, professor of mechanical engineering and director of Case's Systems Research Center, will serve as academic director of the program.

Primary objectives of the course will be to develop the methods and techniques of dynamic analysis as applied to process control, through lectures, system analysis periods, recitation time and laboratory periods.

Participants will have an opportunity to study the derivation of the mechanical behavior of a system to be tested in the laboratory, where dynamic tests will be run on control equipment applied to typical control processes. Studies will be made of the first and second response characteristics and stability conditions.

Arc Welded Design Award Program Is Announced

A $25,000 Award Program for Progress In Arc Welded Design was announced recently by The James F. Lincoln Arc Welding Foundation of Cleveland, Ohio.

The program offers cash awards for papers describing the welded steel design of either machines or structures. Dr. E. E. Dreese, chairman of the Foundation states that the awards are being made to advance progress in the development of better machines and structures through more efficient use of arc welded steel and to recognize individual contributions to this progress.

It is the Foundation's aim that the competition will serve as a

vehicle through which designers, architects, and engineers will find solutions to problems in the application of arc welded steel to machinery and structures of all types.

The competition is open to any U. S. resident who has taken part in the design, planning, or production of the design described in his paper.

Awards totaling $12,500 will be made to the 38 papers adjudged best in the two separate, non-competing divisions—machines and structures.

The object and purpose of The James F. Lincoln Arc Welding Foundation is to encourage and stimulate advance in the knowledge and application of the arc welding process.

High Casualty Rate Noted in Engineering Students

Almost half of the students who start programs in engineering fail to complete them, the American Association for the Advancement of Science learned recently.

The high casualty rate is one of the principal concerns of engineering educators, reported Richard T. Fallon of Michigan State University's College of Engineering.

Fallon, who participated in a panel discussion before the engineering section of the association, is director of the Junior Engineering Technical Society (JETS), which has 742 chapters in high schools and junior colleges in all 50 states and several foreign countries.

"Engineering enrollments have been meeting the bare needs of the economy during the past six years," Fallon said.

He added that such enrollments could be sufficient "if the students who started in engineering remained in the field and graduated with degrees." However, he reported that about half (48 per cent) of the engineering students are lost along the way for various reasons.

Engineering "drop outs" appear to fall into three groups, Fallon noted.

One group "may have the capabilities, talents and interests in engineering," he said, "but they have not been properly prepared or oriented in high school toward engineering.

Another segment of engineering students fail to make the grade but should have been steered out of engineering in junior or senior high schools. "This group just does not have the proficiencies in the basic sciences to handle engineering courses," he explained.

A third group of students who drop out of engineering, "are victims of new pressures and delusions that every one who studies science is going to be a scientist," Fallon noted.

Such students, Fallon explained, "soon defect to other fields when they find that engineering does not offer the glamour they sought or it does not offer them a chance to pursue majors in the disciplines where they built up their proficiencies, such as mathematics, physics and chemistry."

He stressed the need for a more realistic evaluation in secondary schools as to what engineering requires. The high rate of attrition, concluded Fallon, has caused the national government, industry and university officials to support such programs as JETS, which present a realistic picture of engineering and technology.

Arizona Engineers Make Study of Sandwich Shells

Two University of Arizona civil engineers, Drs. Robert Schmidt and Gerald A. Wempner, are conducting basic research on the behavior of "sandwich shells."

The shells are strong, lightweight panels consisting of layers of different materials of types used in missile and aircraft construction.

Wempner, who is also a mechanical engineer, pointed out the space age need for lightweight structures and methods for their analysis. He said the U of A project is an effort to establish general, simplified equations for describing the behavior of sandwich shells.

"The general equations we hope to develop would provide the basis for subsequent solutions to a variety of practical and important problems of structural design," Schmidt said.

Correspondence Course Will Be Offered Nation-wide

For the first time, a major university is offering a nation-wide correspondence course to aid engineers preparing for professionl registration. Titled "Engineering Fundamentals," the course was developed for the University of California by Lloyd M. Polentz, P.E., noted engineering consultant, author and lecturer.

More than 100 examinations utilized by 35 states were analyzed by Polentz during a three-year period of research and preparation. The new correspondence course is designed to be of benefit to all engineers preparing for the first, or closed-book, portion of the engineering registration examination in any of the 50 states or three territories. The course is also aimed at engineers who wish to review fundamentals as an aid to current work or in preparation for advanced study.

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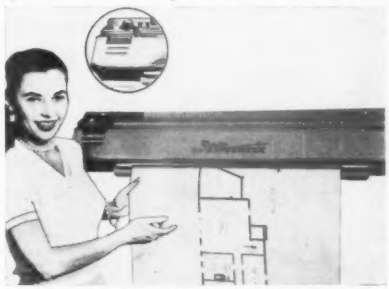

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Engineer/Scientist Index Shows Winter Ebbs, Flows

The demand for engineers and scientists, as measured by the Engineer/Scientist Demand Index developed by Deutsch & Shea, Inc., dipped slightly in November after rising during September and October. The drop occurred primarily in newspaper advertising for technical men; magazine advertising on the other hand, rose slightly. The total dip is less than 3 points.

Engineer Scientist Demand Index Composite Index July=100.0	
August	97.6
September	107.7
October	116.2
November	113.3

For November the newspaper classified section recruitment advertising subindex dropped several points after a sharp increase in October. Other newspaper technical recruitment advertising was down less than two points. Recruitment advertising in technical magazines, however, gained slightly.

Data that comes from the forty-three participating publications is weighted to compensate for the number of days per month, number of issues of the publication and other variables.

The Engineer/Scientist Demand Index is based on information supplied by 27 newspapers in major market areas throughout the country and by 16 technical journals in key engineering and scientific fields.

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After Eight Years, Union for Engineers Dissolves

President Joseph Amann of the Engineers and Scientists of America announces that the eight-year-old federation of independent professional engineer's unions has been dissolved.

ESA's demise has been predicted widely but officially denied in recent months. In announcing the end of the federation, Amann said the "real dissolution" started when the Engineers and Architects Association, ESA's largest group of affiliates, and other major units broke with the federation in 1957 to form the Engineers and Scientists Guild.

The final blow was the withdrawal a few months ago of the Association of Professional Engineering Personnel, holding bargaining rights at the Radio Corporation of America's Camden, New Jersey, plants. APEP's dissatisfaction with ESA stemmed from the federation's financial inability "to take positive action," according to APEP President Larry Schultz. Amann laid this shortcoming to "unrealistic" dues structures, pointing out that the annual dues of eight dollars received from members was insufficient to support its programs.

But undoubtedly the biggest difficulty encountered by ESA was the resistance of engineers in industry to unionism. Even in the few established bargaining units, most ESA affiliates have less than 50 per cent of their units as members.

In announcing ESA's dissolution, Amann predicted that engineers in industry would eventually have to organize, but they will first have to choose between professionalism and unionism. "You can't ride two horses," he said.

Michigan State Set for Conference on Concrete

"Structural Concrete" will be the topic of a one-day conference to be held February 15, at Michigan State University. Sponsored jointly by the Civil Engineering Department of Michigan State and Precast Industries, Inc., of Kalamazoo, Mich., the conference will explore the practical aspects of new and current trends in structural concrete.

Talks will center around four major topics: prestressed concrete structures and structural members; prestressed concrete manufacturer's problems; ultimate and limit design concepts; and shapes in structural concrete.

Edward K. Rice of T.Y. Lin and Associates will be the featured speaker.

'Component Manufacturers May Soon Be Doomed'

More than 90 per cent of the thousands of electronic component manufacturers are doomed to disappear from the American business scene within the next 10 years.

"Accelerated by the relentless demand for standardized products, custom manufacturing houses will either convert to standardized

product lines or fall by the wayside," according to Bernard M. Goldsmith, president of Nytronics, Inc. of Berkeley, Heights, N. J.

"Having started some five years ago, the trend is demanding that custom houses forego their specializations in manufacturing and convert to an operation that will result in smaller production runs but usage by many more customers. This, in effect, is standardization.

"To meet the challenge, we must anticipate design specifications and provide customers with predesigned components that fulfill broad areas of operating characteristics," Goldsmith said. "This can be accomplished by scanning the needs of the fields served, not with the anticipation of receiving an order to produce, but with the knowledge that customers must determine their purchases on the basis of what is available."

According to Goldsmith, this attitude of availability requires greater investments on the part of components manufacturers. "They need not wait around for a sale to happen, they must inspire them by scanning an industry to find its needs and then filling them."

The speaker cited the company's announced production of a new fixed inductor with extreme stability and the ability to operate at 500°C. "At present there is hardly a requirement for a component of this phenomenal temperature ability. But the component was not designed for today. We can anticipate that such a requirement will be the ordinary specification within the next five years, and so we have it ready for industry when they demand it or are ready for its capabilities.

"The trend toward standardization is not a passing fancy," Goldsmith warned. "Essex Electronics, involved in the design and production of electronic components for more than 20 years, does not sell any of the components it produced in 1956. Though we have not changed our basic specialization in the production of inductive components, our total sales now are derived from standardized items, for which we didn't even have a drawing five years ago."

Science Foundation Survey Shows More Engineers Now in Industry

Employment of engineers in industry rose by 6.6 per cent during 1959, according to a release of preliminary estimates on returns from a National Science Foundation survey. This compares with an increase of 4.8 per cent during 1958.

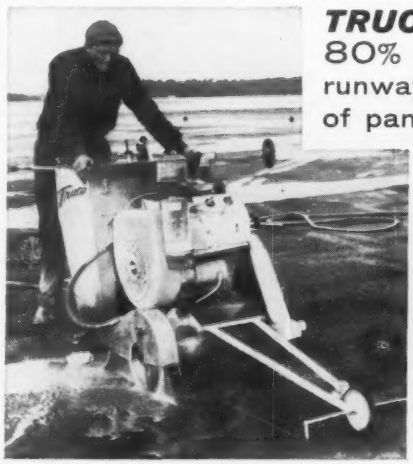
The preliminary release, based upon returns from more than 10,000 firms employing engineers and scientists, shows a number of changes when compared with earlier reports which are outlined in the accompanying chart.

The 1958 and 1959 figures are taken from previously completed and published reports, and the NSF release stated that the final report of the 1960 survey, to be completed early in 1961, may contain revisions of the preliminary figures.

Nearly 40 per cent of the reported engineers and scientists were engaged in research and development activities, according to preliminary estimates from the 1960 survey. This represents a significant increase over the 31 per cent figure noted in the 1959 survey, and is undoubtedly related to the greater-than-average growth in scientific employment during the 1959-60 period.

Two industries—electrical equipment and aircraft and parts—each employed around 100,000 scientists and engineers in January, 1960.

Occupational Group	January 1958	January 1959	January 1960	% Change '58-'59	% Change '59-'60
Engineers	587,400	615,400	656,300	4.8	6.6
Chemists	69,500	71,500	76,900	2.9	7.6
Other Physical Scientists ..	49,000	52,400	57,100	6.9	9.0
Life Scientists..	16,700	17,500	18,800	4.8	3.9
Unclassified Scientists ..	7,800	6,600	6,400	—14.7	—3.0
Total	730,500	764,100	815,500	4.6	6.7



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NYSSPE Continues to Fight Against Engineers' Unions

Continuing its efforts to protect engineers employed by the City of New York from union attempts to organize them for collective bargaining, the New York State Society of Professional Engineers has recommended several changes in the State's labor law to permit professional employees a separate choice on matters of collective bargaining representation, and to officially recognize the right of professional organizations to discuss employment relations with management on a nonbargaining basis.

The Society's recommendations were contained in a statement presented to the Joint Legislative Committee on Industrial and Labor Relations by Frank J. Durkin, member and attorney for the NYSSPE.

The New York Society told the Committee that because the language on the State's labor relations act reflects classic labor-management relationships, it is not a suitable instrument for professional employees in their desire to improve their professional employment conditions. Professional employees who wish to use the facilities of their professional societies rather than labor organizations in their communications with employers have met opposition from the employers who fear a possible violation, the statement pointed out. To alleviate this undesired result of the law, the Society raised several specific points for consideration which are summarized below.

• Regarding a separate vote, the labor law does not provide any specific standards to determine the composition of appropriate units for decision on the desires of the employees on collective bargaining representation. The Society felt that professional employees cannot effectively exercise the free choice given them and other employees under the law if they are required to have their votes counted as a minority of a larger unit. The Society added their interest in seeing the New York labor law amended to permit professional employees the separate vote that is provided in the Taft-Hartley Act.

• The definition of a professional employee which is included in the Taft-Hartley Act was viewed by the Society as being suitable, and was suggested as a basis for a similar definition in the New York law.

• NYSSPE also felt that the term "labor organization" should be redefined with appropriate language added to provide that the term will not include associations or societies composed wholly of professional employees which do not engage in collective bargaining. A clear understanding is needed between management and employees that professional organizations, when involved in discussions with management on such topics as conditions of employment, promotion policies and professional growth and development, do not consider that they are "bargaining collectively." Members hoped that such clarification would encourage more "noncollective bargaining" between professional employees and employers to establish and maintain a favorable professional climate of employment.

• The New York Society's statement added that functional sections of the Professional Society could well serve as a medium whereby professional employees not wishing to deal through labor unions for the improvement of their professional status could discuss problems on a nonbargaining and professional basis.

Meetings of Note

American Institute of Chemical Engineers—National Meeting, February 26-March 1, Roosevelt Hotel, New Orleans, Louisiana.

American Institute of Mining, Metallurgical and Petroleum Engineers—Annual Meeting, February 26-March 2, Chase-Park Plaza, St. Louis, Missouri.

American Society of Mechanical Engineers—Gas Turbine Conference, March 5-10, Shoreham Hotel, Washington, D.C.; Aviation Conference, March 12-16, Los Angeles, California.

Nuclear Congress—Nuclear Engineering and Science Conference sponsored by thirty major engineering societies and Engineers Joint Council, March 20-24, Chicago, Illinois.

American Society of Photogrammetry—Annual Meeting, March 20-22, Shoreham Hotel, Washington, D.C.

American Congress on Surveying and Mapping — Annual Meeting, March 22-25, Shoreham Hotel, Washington, D.C.

American Chemical Society—National Meeting, March 21-30, St. Louis, Missouri.

Kennedy Names Whitton Highway Administrator

Rex M. Whitton, chief engineer of the Missouri State Highway Department, has been appointed Federal Highway Administrator by President John F. Kennedy. In announcing Whitton's appointment to the $20,000-a-year post, the President said, "Mr. Whitton's long background in every phase of highway work will place direction of the Nation's important highway program in the hands of a man of unmatched experience."

Whitton graduated from the University of Missouri in 1920 with a BS in civil engineering. Eight days after receiving his degree, he went to work for the Missouri Highway Department as a member of a field survey party. He won steady promotions and since July, 1951, has held the top job in the Department.

Strictly Business

Personalities . . . **Peabody Engineering Corporation** of New York City and Stamford, Conn., announces the appointment of **John Dunn** as manager of its Marketing and Technical Services Division . . . **Samuel Raber** has joined the engineering staff of **Dorne and Margolin, Inc.,** as a section head in the Circuit Group . . . **Calibration Standards Corporation** has appointed **James L. Fouch** as executive vice president . . . **W. A. Smith,** manager of new product sales for **B. F. Goodrich,** Industrial Products Division, has been named manager, marine and ground support equipment for B.F.G. Aviation Products . . . **S. P. Jacobson** has been promoted to president of the Bowling Division of **Brunswick Corporation . . . The North American Mogul Products Co.** of Cleveland, O., has named **A. W. Pugsley** as chairman of the board, and **C. C. Tippit** as president . . . **Pierre A. Portmann** was recently promoted to the office of assistant director in the Research and Development Directorate of **Page Communications Engineers, Inc.,** a subsidiary of **Northrop Corporation . . . Leo V. McNamara** has been appointed sales manager for the Applied Dynamics Division of the **Atlee Corporation . . . Radiation Dynamics, Inc.,** of Westbury, L.I., has announced the appointment of **Chester C. Thompson** as chief electronics engineer.

Mr. Dunn

The St. Louis Car Company announced the appointment of **James Macdonald** as senior vice president of the car manufacturing firm and of **Winthrop B. Reed** as a vice president . . . **Edwards Company, Inc.,** of Norwalk, Conn., has appointed **Carl D. Cordua** as manager of general engineering . . . **Walter H. Chudleigh, Jr.,** has been appointed a vice president of **Atronic Products, Inc. . . . Milwaukee Cylinder Company,** a division of L. & M. Machine Co., has announced the appointment of **Richard L. Chaltry** as chief engineer . . . **Michael J. Joncich,** general sales manager of **Datex Corporation,** has been elected vice president by the board of directors . . . **M. A. Benanti** has joined **Precision Circuits, Inc.,** as an electronic engineer . . . **Melpar, Inc.,** has elected **Robert E. Miller** to the newly created position of vice president for advanced development . . . **Clark Fellers** will become director of facilities at **Eastman Kodak Company's** Apparatus and Optical Division upon the retirement of **Herman H. Waggershauser . . . Merle H. Banta** has been elected a George F. Baker Scholar, the highest scholastic honor at Harvard University Graduate School of Business Administration.

Mr. Chudleigh, Jr.

The election of **Charles A. Volz, Jr.** as president of **Olympic Products Company, Inc.,** has been announced . . . **J. E. Trainer,** executive vice president of **The Firestone Tire and Rubber Company,** has been elected president of the **American Ordnance Association** . . . Directors of **Minneapolis-Moline Company** have elected **Edmund F. Buryan** as president, chief executive officer and member of the board . . . **Arnold R. McLain** has been appointed general manager of the Yuba Heat Transfer Division of **Yuba Consolidated Industries, Inc.** . . . **Arley J. Ball** has been appointed eastern regional sales manager of **Hewitt-Robins Incorporated** . . . **Richard K. McKibben** and **John K. Sjogren** have been appointed chief engineer and product manager for the Vibro-Equipment Division of **Southwestern Engineering Company . . . The Asphalt Institute** recently elected **L. P. Street** as chairman of the board . . . **Earle M. Jorgensen,** president and chairman of Earle M. Jorgensen Company of Los Angeles, has been elected to the board of directors of **American Potash and Chemical Corporation** . . . **Automatic Control Company** of St. Paul, Minn., has announced the opening of a branch sales office in Chicago, to be headed by **William W. McGuire.**

Mr. Buryan

Babcock Electronics Corporation has announced the appointment of **Woodrow Smith** as engineering manager. . . . Appointment of **Myron Frank** as product manager for Ambitrol Products has been announced by **The Dow Chemical Company . . . John M. O'Brien** has been named manager of the New York office of **Caterpillar Tractor Co.** . . . **Clyde A. Benjamin** has been named industrial engineer with **The Trane Company,** La Crosse, Wis. . . . **Josef H. Buerger, Jr.** has been appointed assistant to the vice president-commercial at the **Crucible Steel Company of America . . . Bill M. Lane** has been named manager of western operations for **Vitro Engineering Company . . . Cubic Corporation** has announced the addition of **Rank G. Johnson** to the company staff . . . **George W. Switzer, Jr.** has been appointed Nuclear Energy Division manager of **Gilbert Associates, Inc. . . . William H. Gropp** has been named chief mechanical/electrical engineer for **Wilsey, Ham & Blair Engineers and Planners** of Millbrae and Los Angeles, Calif. . . . Appointment of **Thomas F. McGovern** as marketing manager of **Keuffel & Esser of Canada Ltd.,** has been announced.

Mr. O'Brien

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FEB. 19-25, 1961

PROJECT SATURN

Heavyweight Booster for Deep Space

Engineering R&D on the 1.5 million pound thrust Saturn booster at the Marshall Space Flight Center near Huntsville, Alabama, foreshadows the role of the engineer in the vast space projects of the near future as man moves out into the solar system and beyond.

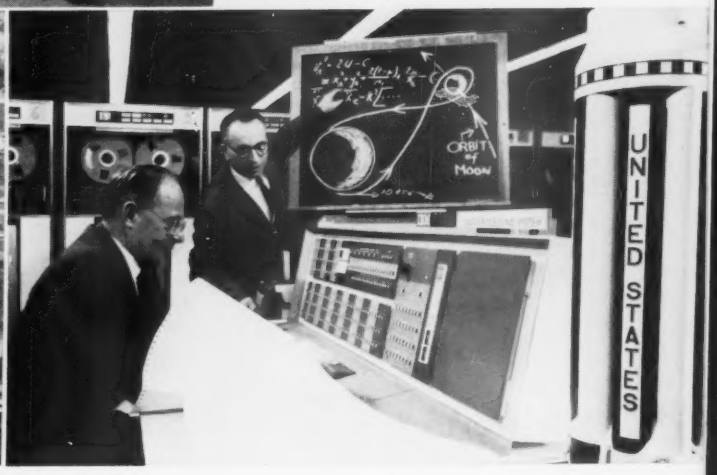
By
JOHN T. KANE
American Engineer Staff

PROJECT SATURN, the mammoth cluster of rocket engines which should ultimately be capable of transporting a manned space vehicle around the moon and back to earth, or an instrument package to Mars or Venus, is taking shape in the red clay hills near Huntsville, Alabama, as one of the most ambitious technological programs of this, or any, century. No one is altogether certain it will "work." But each time the screaming roar of the Saturn booster's 1.5 million pounds of thrust stabs the air for miles around the George C. Marshall Space Flight Center, project engineers can at least say that America's great moon rocket is one step closer to its first R&D firing in 1961 from the massive Saturn launching site now nearing completion at Cape Canaveral.

Left, engineers at the George C. Marshall Space Flight Center look over a table model of the launching and testing complex for the 1.5-million-pound thrust Saturn booster. Right, Wernher von Braun, head of the Marshall Center, checks out a three-stage model of the Saturn rocket assembly.

As the largest and most powerful rocket booster assembly in the U.S., the Saturn is the prime responsibility of a good share of the 1,500 engineers and 4,000 supporting employees of the National Aeronautics and Space Administration's Marshall Center. Headed by Wernher von Braun, the Marshall Center claims to be the only organization in the U.S. which has the capacity to handle all phases of the

Left, a staff meeting for engineering and scientific personnel working on Saturn R&D. Lower left, an air view of some of the industrial buildings at the Marshall Center near Huntsville, Alabama. Below, satellite orbital calculations are reviewed by Computation Division specialists using an IBM 7090 data processing system.



creation of a deep space type rocket from conception of idea, through design, development, fabrication of hardware, and flight testing. The AMERICAN ENGINEER visited the Huntsville area recently to get a first hand view of the scope of the engineering effort which is involved in this particular segment of our over-all space program. Operating on a 1961 budget of $350,000,000, the Marshall Center may well be budgeted near the billion dollar mark in the near future if U.S. space appropriations are increased to a level which would permit manned space exploration in the first half of this decade.

Out of a $100 million plant on 1,200 acres in the midst of the Army's sprawling Redstone Arsenal, Marshall engineers and scientists are churning a variety of space devices—Saturn, the Agena-B and Centaur third generation Atlas type carriers, and the F-1 single chamber, 1.5-million pound thrust rocket engine. In addition, Marshall people are also launching a series of satellites and space probes, and providing and launching the modified Redstone rockets which are to carry the first Project Mercury astronaut on a long ride down the Atlantic missile range.

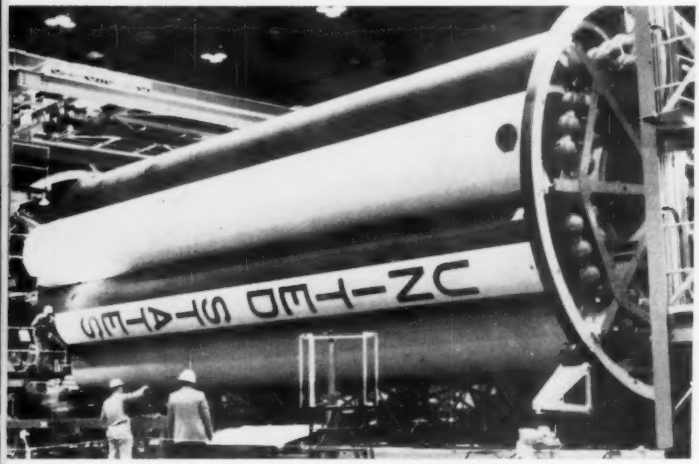
The extent of the engineering effort at the Marshall Space Flight Center might best be conveyed in an outline which lists the technical functions as they are divided among nine divisions:

- Aeroballistics—conducts R&D activities in aeroballistics and related sciences, including vehicle design with respect to aerodynamic parameters, control features, loads, aerodynamic heating and external fluid properties.
- Computation—establishes and conducts high speed digital computation, simulation, and data reduction in space vehicle R&D, test, and flight firing. This division operates one of the largest concentrations of computation equipment in the non-Communist world.
- Fabrication and Assembly Engineering—produces experimental model and prototype super boosters and space vehicles.
- Guidance & Control—designs, develops and does pilot manufacturing of guidance, control, electrical network, missile-borne tracking, measuring, telemetering and range safety devices, components and systems for space vehicles and ground support equipment.
- Launch & Operations—plans, coordinates, schedules, and directs the checkout and launching of NASA boosters and space vehicles at both the Atlantic and Pacific missile ranges.
- Research Projects—initiates and executes original and supporting scientific research in specialized fields, and collects and evaluates scientific and technical information.
- Structures & Mechanics—conducts R&D in structures, mechanics, propulsion, chemistry and materials as related to super boosters and space vehicles.
- Systems Analysis and Reliability—establishes and maintains a quality control program for rocket systems during the developmental manufacturing and assembly phases.
- Test Laboratory—performs experimental and developmental testing on super boosters and complete rocket systems and their components, including static firings, and

provides an independent evaluation of test results and recommendations on design criteria.

The role of engineering in the so-called space age is perhaps nowhere more clearly underscored than in the Saturn program. The technological complexity of this enterprise is achieving enough energy in a few minutes to coast to the moon is such that it appears more like an entire industry than a project. Every known engineering specialty is involved at one point or another. To stand below the Saturn booster mounted on its static firing test stand (the *bottom* of the rocket itself is four stories from the ground) gives one a definite feeling of man's arrival at a point in technological evolution where he is truly ready to move out into the depths of the solar system and beyond. From the six million pounds of reinforced concrete at the base of the firing stand to the miniaturized guidance sensors in the rocket's electronic innards, Saturn can be described as nothing less than a compendium of the engineering knowledge and skill of our time.

In detail, the first configuration of the Saturn system is designed as a 3-stage vehicle, 185 feet high and weighing in at about 1,160,000 pounds fueled and ready for launching. Nearly a million pounds of this will be fuel and oxidizer. The first stage of this behemoth is 82 feet high and about 22 feet in diameter, and consists of a cluster of eight Rocketdyne H1 engines burning kerosene and liquid oxygen. Some 750,000 pounds of propellants will enable this first stage booster to provide 1.5 million pounds of thrust.

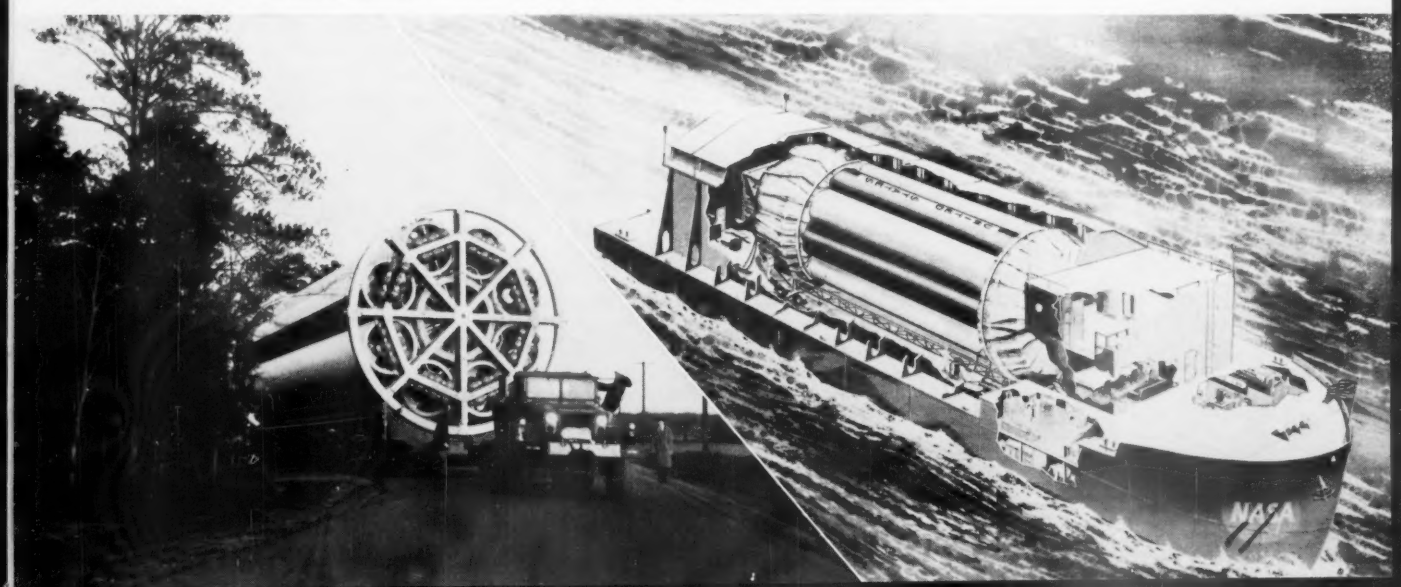


The Saturn booster at the final assembly stage in the fabrication shops at the Marshall Center.

The Saturn second stage vehicle is powered by four liquid hydrogen fueled rocket engines, each developing 17,500 pounds of thrust. Douglas Aircraft is producing this stage, with the basic engines produced by Pratt and Whitney Aircraft. Convair is doing the third stage, which will be powered by two liquid hydrogen-fueled engines identical to those of the second stage. This first three-stage Saturn configuration is expected to orbit payloads on the order of 20,000 pounds. Marshall engineers estimate that later configurations adding a fourth stage should make it possible to orbit payloads up to 45,000 pounds—a weight area in which feasible planning can be undertaken in sending a manned vehicle around the moon, or impacting instrument packages on the nearby planets.

Engineering ground support operations in missile and space activity have always been a vital, if greatly underpublicized, factor in the total space operation. With systems of the size and complexity of Saturn, this engineering support factor increases immensely in importance. A specially designed and constructed 450-ton barge, for example, had to be made to transport the 82-foot-long Saturn first stage booster from its Alabama birthplace to the Nation's spaceport at Cape Canaveral—a journey which will take each booster over some 2,200 miles of rivers, inland waterways, and ocean. On the launching pad at Canaveral, the Saturn will be erected, fueled, serviced, and

Transporting the mammoth Saturn booster from its birthplace near Huntsville to Cape Canaveral, Florida, is in itself an engineering project. The barge at right had to be designed and constructed to carry the Saturn booster over some 2,000 miles of water to the launching site on Florida's Atlantic coast.



checked out from a 254-foot-high servicing tower. Half as high as the Washington Monument and the tallest structure in the State of Florida, this network of movable steel, concrete, electronics, and machinery is in itself a large scale engineering project.

The computational, or "electric slide rule" activities of the Marshall Space Flight Center make up another phase of technology where the exponential growth curve of the engineering contribution to space exploration can be emphatically shown. The von Braun team of former German engineers, scientists, and technicians working with their American colleagues, developed the Army's Redstone ballistic missile back in 1951 on a card programmed calculator which added figures at the rate of 2,174 per minute. The computation for Project Saturn is being done on an IBM 7090 processing system—a solid state computer with data available from storage in 2.18 millionths of a second, and with the capability of adding 13,740,000 figures per minute.

The Computation Division at Marshall, housed in what might be taken for a fairly large modern factory or office building in most American cities, has to do with the arithmetic for such Saturn problems as the effects of vibration and heat transfer caused by interaction of the multiple engines; thrust alignment which determines where the actual thrust vector of the engines is located; and multiplexing of fuel and oxidizing engines to provide continued power in the event of one or more engine failures. To gather this information for computer reduction and analysis, more than eight to ten times as much data is taken from each static firing of the Saturn booster than from any previous space vehicle. In early static tests, information was collected from 790 instrument channels attached to the booster.

Dr. Helmut Hoelzer, director of the Marshall Computer Division, can look back to a missile era when the German V-2 had to be test-fired nearly 1,000 times chiefly because there were no automatic digital computers for flight simulation. Dr. Hoelzer's staff is simulating Saturn flights in the computers with stored equations representing everything from weather conditions to the rotation and gravitation of the earth and the moon.

But if a project such as Saturn calls for extensive engineering participation, it also predicates extensive professional development on the part of the engineers involved. The advanced technology drawn upon by Saturn demands a level of engineering talent which needs to be continually enriched by graduate school study. At Marshall, the professional engineer has educational opportunities in graduate and undergraduate courses, seminars, and special short courses. The major fields of study are in engineering, mathematics, physics, and management. The University of Alabama, Athens College, and Alabama A&M offer graduate and undergraduate work for Marshall engineers. The University of Alabama Huntsville Center affords a selection of graduate courses ranging from advanced mathematics through electrical, metallurgical, mechanical, and aeronautical engineering. Professional and technical seminars and short courses are offered periodically by MIT and a number of state universities. A tuition assistance plan is available for engineers, and leave of absence is permitted for resident academic work leading to the doctorate.

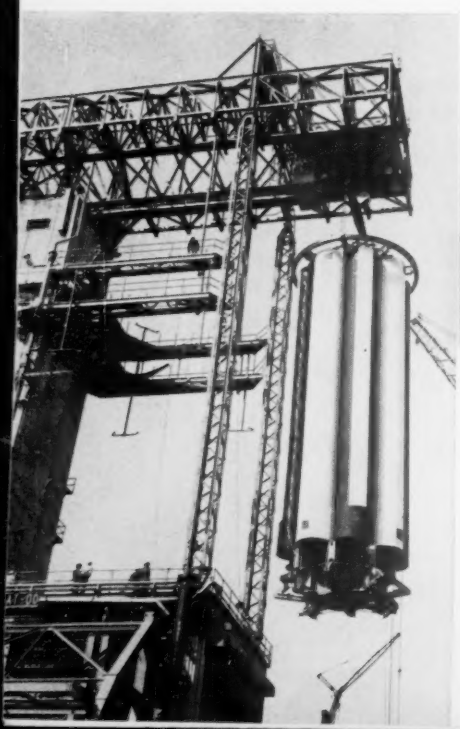
Marshall engineering recruiters currently find electricals in shortest supply. "We could use about 500 properly qualified engineers right now in all the branches," a personnel chief at Huntsville told the AMERICAN ENGINEER. Personnel specialists at Marshall feel that the widespread publicity given to Dr. von Braun has been a big factor in attracting professional people with a strong interest in the U.S. space program.

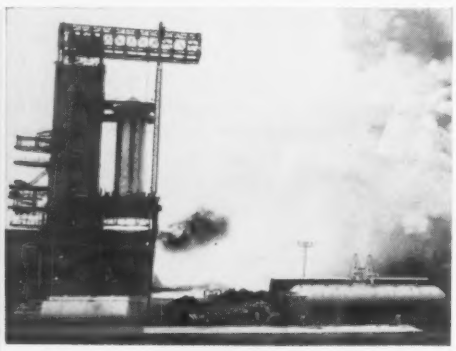
It might fairly be asked at this point if the U.S. space program is, in its heavy booster phase as exemplified by Project Saturn, putting the U.S. on an equal footing with the Soviet Union in the ability to lift heavy orbital and lunar payloads. Any positive answer to this question, which will surely be viewed by the incoming Administration as one of the largest and most important on an agenda crowded with large and important questions, would have to presume a cognizance of the construction and launching schedule of Soviet space planners. In the absence of

(Continued on page 48)

ABOUT THE COVER:

A scale model of the three-stage Saturn stands in front of one of the 1.5 million pound thrust Project Saturn boosters under construction at the Marshall Space Flight Center near Huntsville, Alabama.





Left, hoisting the Saturn booster up to the static firing stand at Huntsville. Right, Flaming exhaust gasses from the eight Saturn rocket engines blast out across the static firing area as the booster is put through preliminary firing tests.

FROM WASHINGTON

BY
MILTON F. LUNCH,
N.S.P.E.'s Legislative Counsel

Task Force Reports ►

The month preceding President Kennedy's inauguration was notable and unique in the annals of pre-inauguration activities for the series of task force reports presented to the President. The reports, prepared by panels of experts and leaders in various fields of anticipated programs, constitute an informal blueprint of what may be in store during the first year or so of the new Administration. It should be noted, however, that the President in releasing the various studies and recommendations did not commit himself to anything and retains a free hand in accepting, rejecting or modifying the suggested courses of action. Following are the highlights of these reports in the areas of major interest to the engineering profession.

◄ Housing and Urban Development

President Kennedy had previously announced his support for a new cabinet-level Department of Urban Affairs. This is endorsed by the task force. Already several bills have been introduced to carry this idea into effect, but the new Administration is yet to unveil its detailed recommendations for implementation. It is agreed by all sponsors that the nucleus of the proposed new department will be the Housing and Home Finance Agency. Beyond this, however, there is no indication of what other agencies or functions should be transferred. There is some speculation that the Bureau of Public Roads might be switched from Commerce to the new agency because of the close relationship of the highway program to general mass transit problems.

The task force suggests a mass transit program for planning grants and $100,000,000 for public facility loans. In addition, it is suggested that there be a four-year authorization of approximately $650,000,000 annually for urban renewal and additional funds for urban planning grants. The community facilities program should be expanded to $750,000,000 over a four-year period, the task force suggests, under a system of partial grants rather than loans. It is also recommended that the new program broaden project eligibility, increase funds for public works advance planning and change it to a grant basis and increase funds for water pollution grants, to be administered by the housing agency.

Higher Education ►

A task force led by a distinguished engineer, Frederick Hovde, president, Purdue University, calls for spending some $10 billion over the next four-and-one-half years to aid public schools and colleges. The bulk of the college money would be used for construction. The housing study report had also called for $500 million a year of new Federal loans for college housing projects. In elementary education, the Hovde report supported an expenditure of $30 per annum per pupil, the money to be used by the states for construction, teachers' salaries, or other educational purposes. In addition, funds would be provided at the rate of $20 per annum per pupil for lower income states and for large cities.

For academic facilities, the Hovde group said plans must be made to accommodate a million new students in the next five years. The report recommends legislation providing for a combined program of loans and grants of at least $500 million for the first year, of which 70 per cent should be for matching grants and 30 per cent for loans. The College Housing Loan program has been "outstandingly successful" in its ten years of op-

eration the study reported, but it has suffered from uncertainty. An increase in the loan authorization of $150 million to take care of anticipated additional needs for the current fiscal year and an increase of $350 million per year for the three succeeding fiscal years was recommended. A President's Advisory Committee on Education was also suggested. "Such a move," it was stated, "will demonstrate that the President believes that education is one of the truly fundamental and important requirements for the preservation and development of the American society, and will place the field of education on a level with that now enjoyed by President advisory groups in both science and economics." Other major recommendations call for full implementation of the report of the President's Science Advisory Committee, "Scientific Progress, the Universities and the Federal Government" (AE, Jan. 1961, p. 25); stimulation of private giving in support of educational institutions through recission of adverse Internal Revenue rulings; allowance of full costs of University research under generally accepted cost accounting principles.

◄ *Space Exploration*

The space task force was chaired by Dr. Jerome B. Wiesner of M.I.T. and former professor of electrical engineering at that institution. Dr. Wiesner has since been appointed as the Science Adviser to the new President. The report maps a suggested acceleration of the space program, with more emphasis on missiles, aeronautics research and the practical application of available space technology. Military space development should be consolidated under one responsible head, either from one of the military services or from a new Pentagon agency, it was said. The space program has been handicapped "because too few of the country's outstanding scientists and engineers have been deeply committed to the development and research programs in the space field," the panel commented. "In changing the management structure and in selecting the administrators for the effort, the need to make space activities attractive to a larger group of competent scientists and engineers should be a guiding principle." The Wiesner report also declared that "our space agency must insure a wide participation in its program by scientists from universities and industrial laboratories, where our greatest scientific strength lies."

► *The American Economy*

The now acknowledged current recession makes the report of the task force on the economy, headed by Dr. Paul A. Samuelson of M.I.T., one of the most significant of the series of reports. In brief summary, the report suggests heavy increases in Federal expenditures for public works, covering school construction, college housing, urban renewal, slum clearance, improvement of transportation facilities, hospital construction, water resources, highways, public building construction and military construction. In the highway field, it is suggested that steps which might be taken are relaxation of contract controls over state obligations, authorization of repayable advances to the states to meet their ten per cent matching requirement, and waiver of the pay-as-you-go amendment to permit full apportionment of future interstate authorizations and, if necessary, an increase in the authorizations.

One of the first task force reports was from the group headed by Senator Paul Douglas of Illinois, urging quick action on a depressed areas bill along the lines of the legislation vetoed twice by former President Eisenhower. This move is likely to have priority in the Kennedy Administration schedule. The Douglas report recommended an emergency program of small public works projects limited to distressed areas, pending a study of whether a nation-wide emergency public works project should be undertaken. The report also urged direct Federal loans to business firms to build new factories and stores, direct Federal loans to cities and towns for roads, waterworks, industrial parks and other facilities, with outright grants of money in extreme cases. Also, the report proposed channeling more defense orders into distressed regions, a speed up in the letting of highway contracts, interstate redevelopment commissions for certain hard-hit regions, more money for reforestation and flood control work, and an expansion of Federal research on the use of coal and other minerals.

Where Does Science Stop ... and Engineering Begin?

By

JOHN R. RAGAZZINI, P.E.

Dean, College of Engineering
New York University

THE loose use of the labels "science" and "scientist" in the public press in connection with space programs has done much to cloud the issue of "who does what" in some of today's more vital technical projects.

The professional role of the engineer compared to that of the scientist is one of the most serious misconceptions today in the technical professions. Chemists, mathematicians, and physicists all make significant contributions to the important technical projects which receive frequent publicity. On the other hand, various categories of engineers are usually principal contributors to such programs, and the work of the engineer is often identified as being performed by scientists and mathematicians.

The engineer of today, and indeed, tomorrow, is a much different individual from his counterpart of even a decade ago. Originally the engineer was a person who designed and built military weapons and defenses. Frequently he still is, but he has expanded his activities far beyond this limited scope. He now deals as well with civilian and peacetime needs. In ancient times the engineer produced things by trying over and over again until successful. Today, through the application of science, mathematics and engineering education in general, the engineer need not repeat failures in order to learn. Instead he builds a rational basis for predicting how his concepts may be realized long before they are translated into specific products.

A dramatic case in point is represented by the missile systems now so prominent in the news. Can you imagine what would happen if an engineer tried to design such a system by rule of thumb and by trial and error? Even with the most painstaking study in application of the best scientific and technological principles, there have been failures. Without the scientific method the whole concept of space flight would be utterly impossible of realization.

The engineer applies scientific principles which have been discovered by the scientist. In application of the principles, frequent use is made of the tools of the mathematician. But today's engineer, who is concerned with research and advanced development in most engineering disciplines, requires a knowledge of certain specific areas of chemistry, physics and mathematics comparable to that possessed by the specialists in these fields. The difference between the engineer and the scientist is one of objective. The engineer's ultimate goal, even in research, is the synthesis of knowledge to produce structures, materials, devices or systems for the betterment or protection of mankind rather than the mere discovery of knowledge for its own sake.

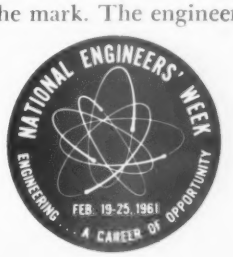
Many prominent individuals are concerned with the proper identification of the respective roles of the scientist and engineer. Suitable differentiation is essential if large numbers of our Nation's youth are to avoid frustration and disappointment in the early years of their professional lives. Dr. James R. Killian, former head of the President's Scientific Advisory Committee, has stated the present situation rather succinctly as follows:

> **Some of the great engineering accomplishments of our time have come to be loosely tagged in the public mind under the generic title of science. This confusion is not in the interest either of science or engineering, and the scientists are as unhappy about the conclusion as the engineers. I do not advocate any less emphasis on science and its importance. I do urge a comparable emphasis on the role and importance of the engineer.**

You have all read in the public press how scientists have been responsible for such items as the conception, development, and launching of satellites, space vehicles and guided missiles, the development of the atomic submarines, and the development of systems for the peaceful applications of nuclear energy. In fact, however, these projects are all engineering programs, and their realization has been possible because of the diligence of engineers, assisted at times by mathematicians, physicists, and chemists.

For one considering education for a career in engineering, it is of paramount importance to look where engineering is going and not where it is or where it has been. One conclusion as to the future of engineering is readily apparent: The time interval between the discovery of new scientific knowledge and its practical application is rapidly diminishing to the order of zero. This makes mandatory the education of a prospective engineer as virtually an "applied scientist." Engineering education for the future must take the form of a broad scientific foundation with considerable attention paid to application.

Once in jest, I made the remark that the engineer of the future is an "organized physicist." On reflection that remark was not too far from the mark. The engineer must



be as much a scientist as the scientist himself, but he has the additional burden of bridging the gap between science and application.

Possibly such a person is merely the composite of a number of people, no one engineer being able to cover the broad requirements all by himself. The modern engineer is one whose competence ranges from science to application and further, implementation, design, and even the sale of the product. A common base to all these requirements, however, is a fundamental applied scientific training. Without this the future engineer will find it difficult, if not impossible, to continue creative contributions beyond his initial entrance into professional life.

Before going further, it may be worthwhile to determine just what an engineer is. Broadly speaking, he is a professional man much the same as your doctor or lawyer.

His mission is to marshal science, men, materials and money to create and produce the things needed by society. This is a broad assignment and no one individual can completely fulfill all phases and functions of his profession.

The engineer may be as much a scientist as the pure scientist himself, but he is characterized by a different motivation—he studies science and its fundamental laws primarily for the purpose of applying them to the needs of society.

Thus, the engineering scientist must seek out natural laws, understand them and use them to create things and systems for his fellow man.

Functionally, engineers engage in this work by dealing with the study of science, thereby becoming engineering scientists, or they may be engaged in the process of creating products and systems based on these scientific studies. They may be more concerned with applying scientific methods to the organizations of men and machines required to produce these things, or they may be engaged in what one can call public works—structures, water works, power plants and similar things more closely associated with public and governmental subdivisions.

No matter what the function or discipline, the engineer must be fundamentally an applied scientist who can apply natural laws to the needs of our society. It is this mission of service and this motivation that constitutes one of the most rewarding aspects of engineering.

Men and women today are entering college at a time when opportunities for challenging careers abound. Whether their choice is science or engineering, I am sure they will find a technical profession rewarding.

It may be helpful to consider a specific research program which is now in process in the Department of Electrical Engineering of New York University. The program is concerned with the instrumentation of satellites and hypersonic vehicles for precise surveying, mapping and target location. A major part of the research is the investigation of a control system which uses data from a gyroscope and horizon scanning device to stabilize the attitude of the satellite so that it continually looks toward the center of the earth. The control system itself, although complex, is readily simulated on the extensive analog computer installation in the engineering department.

This is a program which makes ample use of physics and mathematics although it is an engineering program. The basic problem involved is the establishment of geodetic control points, a grid of points on the surface of the earth whose position is known quite accurately. A satellite or other space vehicle photographs the portion of the earth under consideration either by the use of television or infra-red scanning means. In order that it may be feasible to transmit the data so obtained to the earth with the limited power sources available in the space vehicle, it is necessary to code the picture data collected. The data may then be transmitted to the surface of the earth at which location a decoding process must take place following which an approximation to the original image is constructed. The problems involved in the process of data collection, coding, transmission, decoding and reconstruction are typical of those faced by many electrical engineers today.

On the other hand, as you can readily see, engineers responsible for the solution of the problem in this program must be well acquainted with many principles of physics and mathematics. For example, the characteristics of the pickup devices, including their sensitivity to radiation of various wavelengths, are an important part of the problem. The transmission properties of the atmosphere between the earth and the satellite, both from the standpoint of the radio waves used for the data link and the electromagnetic radiation used to obtain the photographic image involve many interesting physical problems. From the mathematical point of view, there are problems associated with the orbit of the satellite, the navigation systems needed for the precise location of the space vehicle, and the details of the coding processes which are to be included to minimize the band width required for the radio data link.

There is one typical example of an engineering program which requires a rich knowledge of physics and mathematics. A wide variety of comparable examples could easily be provided.

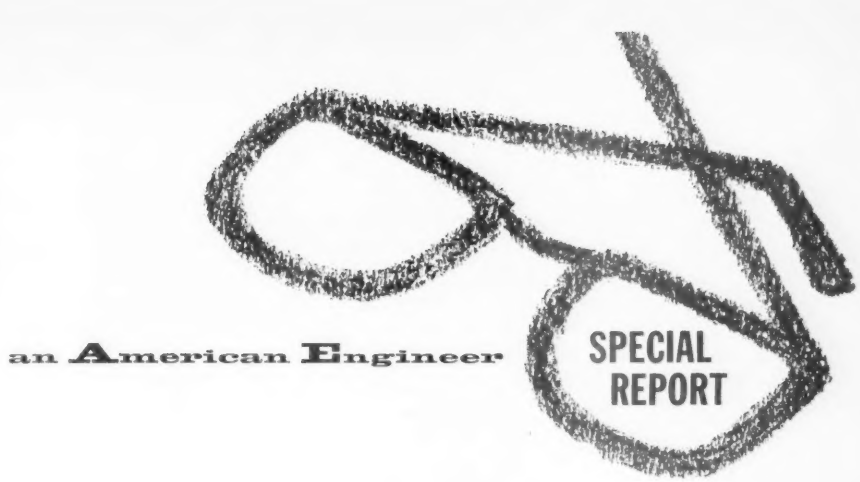
Scientist or engineer? The basic pattern is clear. The first discovers new scientific knowledge; the second applies the scientific principles usually with the aid of considerable mathematics.—**End.**

About the Author . . .

Mr. Ragazzini

John R. Ragazzini received his B.S. in electrical engineering from City College of New York in 1932, his A.M. and Ph.D. from Columbia University in 1938 and '41. He began teaching at CCNY School of Technology then moved to Columbia until 1958 when he became dean of the New York University College of Engineering. Much of his earlier research on computers has been applied by the Air Force in developing means of intercepting aircraft. He is coauthor of the book *Sampled-Data Control Systems.*

Chicago Chapter ISPE Establishes Engineering Aid and Referral Bureau



"Place service before profit, the honor and standing of the profession before personal advantage, and the public welfare above all other considerations. . . ."

So reads the Engineers' Creed. Similar to this are pledges made by members of the other professions—law, medicine, dentistry, education.

Implied is responsibility—a professional and civic responsibility to other persons and institutions. And in performing his job, it is a safe bet that any professional engineer will live up to this Creed.

But is this enough—simply following this standard in private practice? Considering proposals and actions of other professions and in at least one segment of the engineering profession, the answer would seem to be, "No."

Amplifying this answer, the Chicago Chapter of the Illinois Society of Professional Engineers asks another question: "Why doesn't the professional engineer take the lead and offer his services to the public and the community with a system comparable to those used by the medical and legal professions?"

Specifically, this Chapter has drawn up blueprints for a Professional Engineering Aid and Referral Bureau, which aims to function in much the same way as do legal aid bureaus in law or clinics in medicine.

The Bureau's function will be primarily public service. On one hand, it will work with individual engineering needs, and on the other it will provide a central point for civic responsibilities of the engineering profession in the Chicago community.

Also, the proposed Bureau will provide professional referral services, offering those in need of engineering services lists of professional engineers able to meet their needs.

As seen by the Chicago Chapter, the two main functions of the proposed Bureau would be roughly these:

- First, to secure engineering aid at nominal fee for people who legally or otherwise require a professional engineering opinion on a matter and cannot afford to retain an engineer; and secure engineering aid for people or firms who cannot find an engineer to handle their needs even though able to pay an adequate fee.
- Second, to act as an organizing group for performing certain public services to meet the needs of a general public nature and involving public health, welfare and safety; and to aid in performing work needed from engineers in times of disaster, such as earthquakes, floods, and so on.

That such civic and professional responsibilities fall to the engineer is unquestionable. But by going one step further to meet these responsibilities, it would appear that they can be fully faced and more professionally dealt with.

Through the Chicago Chapter of ISPE, the Bureau has been set up, according to Harry P. Watson, P. E., "to encourage the performance of service to the public, and to bring a stronger image before the public of the engineer as a professional man. . . ."

With this in mind, another comment by Watson would seem to follow: "Volunteers have been requested to staff this Bureau, and the response has been large, both from young engineers and those long established in the profession."

What kind of men are needed, and how should the Bureau be run? If the ISPE format is to be followed, it works something like this. The Bureau is run by a committee, with a minimum of six members. At least three members belong to ISPE, and at least three belong to the Chicago Association of Consulting Engineers. (Actual membership on the committee is presently closer to ten.)

In terms of engineering specialties, the breakdown runs this way: One mechanical engineer, one electrical engineer, one structural engineer, one product and machine design engineer, and one civil engineer. This, of course, is simply a foundation—minimum recommendations rather than maximum.

Members serve a two-year term, with the terms staggered. The members of the committee elect their own officers.

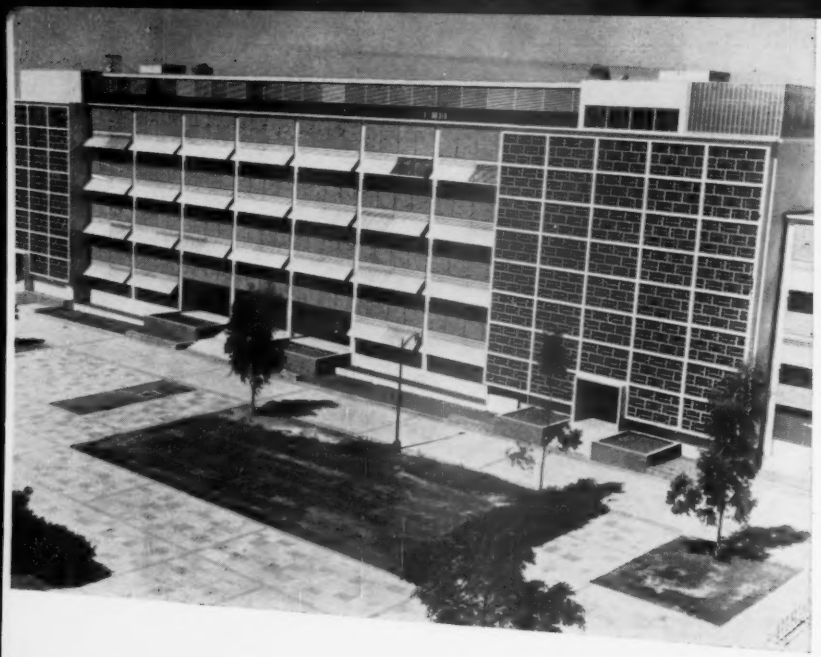
Their job is to fulfill—in detail—the main goals outlined above under a more detailed set of specifications included in the original proposal. Taken a point at a time, this is what the Bureau will do.

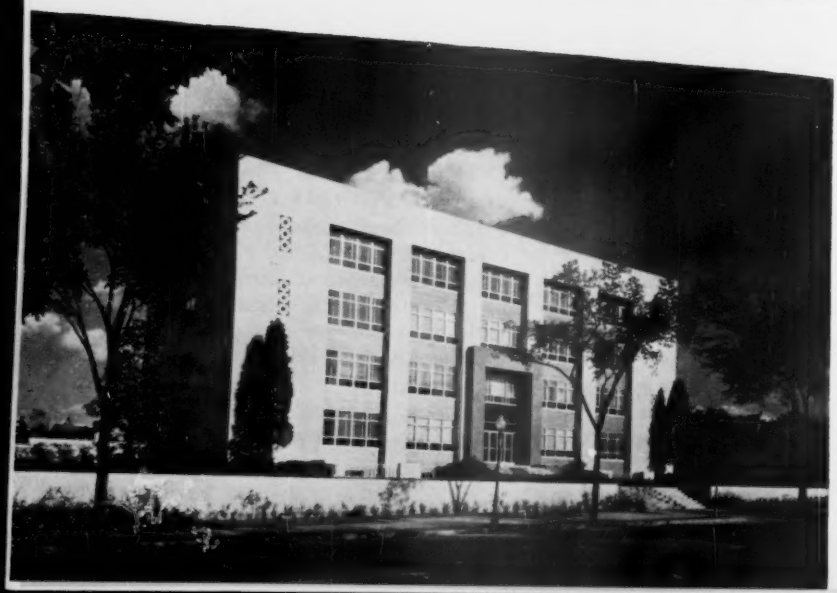
First, there is the job of providing engineering services—or access to them—to the general public. This is *not* free engineering, in any sense of the term. To the contrary, the most detailed section of the proposal outlines a rigorous screening process for applicants for this kind of help.

If fees can be paid by the client, the Bureau simply hands him a list of engineers in the area who are qualified to do the job he has.

If the client is unable to pay the going standard of fees for engineering services, a flat minimum of $6 is set for a first consultation with the engineer who will work on the job. From that point on, fee negotiations are left up to client and engineer.

(Continued on page 54)





Where Opportunity Begin

The

The many opportunities available to to
he takes his first step toward entering the
tical purposes, that step would be registr
gineering. A new engineering student ma
any one of the five major branches of en
that there is at least one college which can
available for that field.

Shown on these pages is only a sampling
and equipment found on engineering cam
The upper left photo shows the second uni
ing at the University of California at L
structure true to the modern architecture
campus.

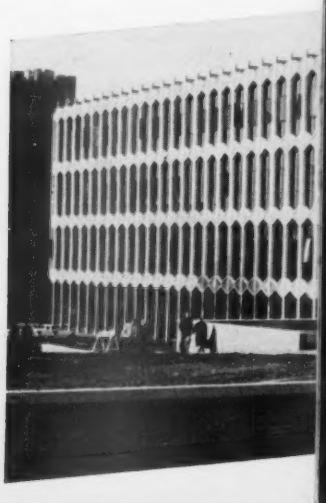
At left center is the Arthur R. Keller
Hawaii. Built in 1949, the Hall houses not
mathematics departments, but also the u
tronic computer. It contains a third in
sunshades operated by solar cells.

The lower left photo shows the Tompki
George Washington University in Washin
it houses the giant computer shown center
from the Air Force and is used in the De
gineering for biomedical research. Operati
son Grisamore, executive officer of the
Wiggins, engineer in charge of installing

The picture below center is the $1,178
Building at the University of Washington
pleted in 1959. The unusual pattern in th
harmonize the contemporary building wi
architecture on the rest of the campus. U
constructing a nuclear reactor building for
to the Argonaut University training react
conjunction with the U. S. exhibit at the
ference in Geneva, Switzerland. Similar r
at the University of Florida and UCLA.

The photo at lower right shows the 1
University of Florida. Tracking hurrican
work, but it is also used daily to furnish
for research in engineering as well as othe

A development for the future is shown i
of the Long Beach State College's new en
many now under construction on various



Engineering Campus

ay's engineer begin when
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choose to specialize in
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Tall at the University of
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reactor designed similar
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58 Atoms for Peace Con-
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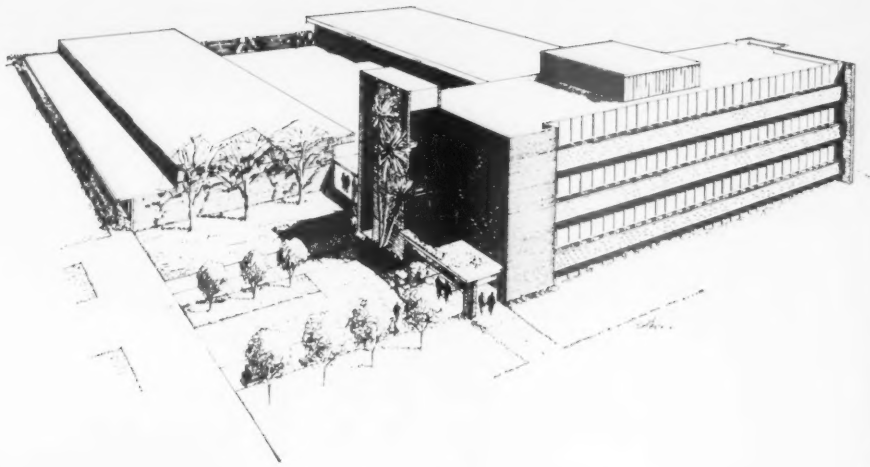
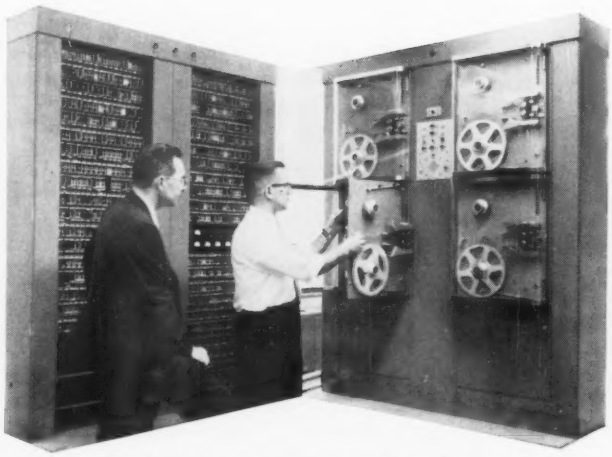
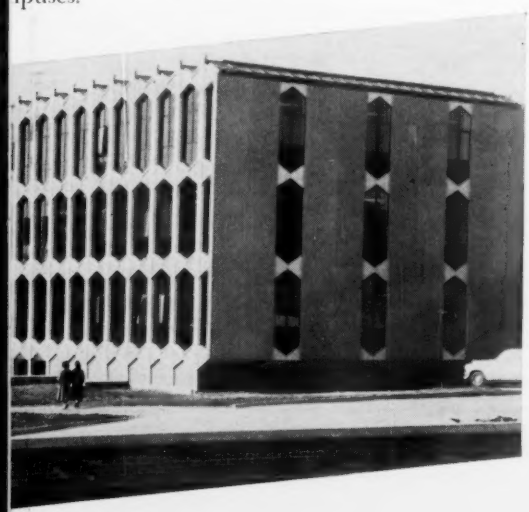
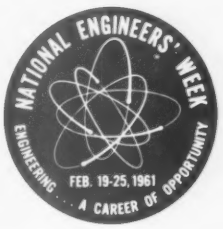








Students now entering engineering campuses have the opportunity to study, not only in pleasant surroundings, but with the most advanced equipment. The computer, reactor and radar tower discussed here are only representative of the same and other new developments on engineering campuses across the Nation, planned to give the engineer in training every advantage for becoming an adept professional.

The Problem of

DECLINING ENROLLMENTS

on ENGINEERING CAMPUSES

By
FRED HAMLIN
American Engineer Staff

For the third straight year, freshmen enrollments in engineering school throughout the country have fallen off from the previous year. From a high water mark of 78,757 in the fall of 1957, enrollments of engineering freshmen have continued to drop. However, this year's decline was more slight than in the two years preceding.

Against this, enrollment for engineering graduate work has continued to climb for the fifth consecutive academic year, reaching a new high for graduate engineering enrollees.

But perhaps the most important single factor bearing on the future of the engineering enrollment and manpower situation is stated by an official of the Department of Health, Education and Welfare: "In engineering, the long term trend is *up*."

Already, the rapid downward drop has slowed. With the 11.1 per cent falloff in enrollment in 1958, the worst seems to be over. And HEW officials expect the upward trend in engineering students, which has occurred in all but three of the last ten years, will begin again in the near future. Ranging from hysterical alarm to complete unconcern, the reactions to the drop in freshmen engineering enrollments over the past three years cover the spectrum of emotion, interpretation and reason.

For all of this, there is a fairly obvious reason. In this country today, technological advances are coming faster and more significantly than they have ever before. Nor is this mushrooming technology confined to the United States. To the contrary, it is worldwide, and has become one of the most hotly contested fields in today's cold war. As a result, just about everybody has an opinion on the subject—some informed, some uninformed; some tempered by logic, others fanned by emotion.

At one extreme, there are those who maintain that the drop in engineering enrollments is tantamount to throwing the cold war out the window into the Russians' waiting hands. At the other pole, there are those who simply don't understand the situation and choose to ignore it. In neither case is there to be found what could be called the most realistic or most logical statement of the problem, if it is a problem.

Somewhere between these extremes reasonable answers are most likely to be found regarding both the general situation and a number of specific points which have been implied. Essentially, the questions to be answered are these: What does the drop in engineering enrollment mean to the engineering profession? What does it mean to the Nation's technological advancement? How can the effects be accurately measured? Where will the declining enrollments first make themselves felt? What other factors bear on the over-all situation? How will the caliber of over-all engineering manpower be effected?

Clearly, a lot of answers are needed. But as things now stand, it is possible to get almost too many answers—one set for just about every person you talk to.

Probably the most logical place to begin is with the broad man-

power picture for the next decade.

Department of Labor statistics on available manpower, broken down by age groups and projected over the next ten years, offer a fairly lopsided picture. This is because it is during this period that the depression slump in birth rates will be most acutely felt by the Nation's working population. This means, for instance, that nearly half of the total work force will be under age 25; that there will be a relatively small increase in workers between 25 and 34; a larger gain in workers over 45; and that between the ages of 35 and 44 there will actually be a drop in the number of available workers. The foregoing will be true in spite of a trend to more schooling on the part of younger workers, and earlier retirements for workers over 45.

Going one step further, this means that in 1965, the number of workers aged 25 to 34 in the total work force will have fallen off by 626,000 from 1955; and that by 1970, there will be some 200,000 fewer workers in the 35-44 age group than there are today. Thus, there is a slump in the Nation's work force on the horizon. And it will be most severely felt during the next ten years. Couple this with one other factor bearing on the same situation.

Department of Labor predicts that in the next ten years, the so-called white collar classes will grow rapidly in proportion to the rest of the labor force. This growth will be led by engineering and related professions in terms of demand. Labor Department puts it bluntly: "The fastest growth will occur among professional and technical occupations, especially engineers, scientists and technicians."

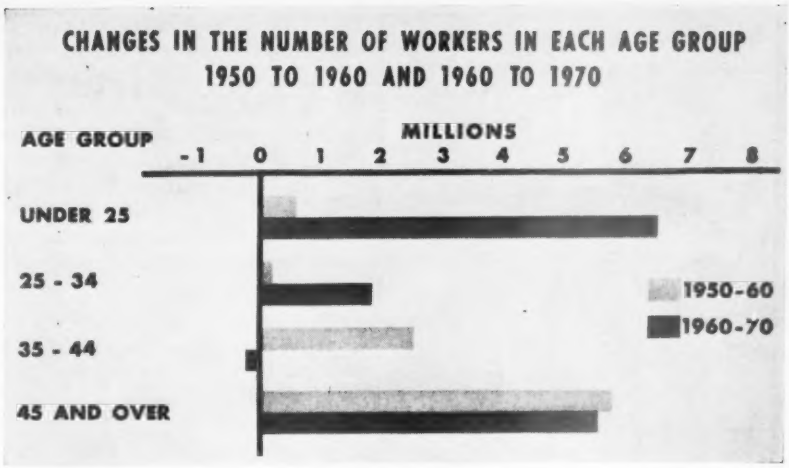
This will result from rapid expansion of research and development activities, plus a marked increase in application of technological improvements. What it adds up to is a better-than-forty per cent increase of professional personnel, well above twice the average gain projected for other occupation groups for the same period.

Put next to the engineering enrollment situation, what this creates is a sort of variation on the well known law of supply and demand. While the need for engineers goes continually upward, the number of engineers available could conceivably fall off as the result of declining engineering enrollments in the recent past.

Where this all leads is presently open to just about anybody's interpretation. But some of the ideas on the way the trend is headed are worth considering.

From one point of view, there could be an outright gap, in precisely that profession where it could do the country the most harm—engineering. If this were to happen, the consequences could be serious with so much of the Nation's economy deriving directly or indirectly from engineering. Indeed, if this were the outcome, it could have international repercussions, for the nature of the cold war situation in the world today has heavy technological implications. And yet, from outward appearances, the following would seem to be the U. S.'s reaction in the face of this challenge:

- Freshmen engineering enrollment down for the third straight year.
- A sag in past engineering enrollment which could effect graduate enrollment in the near future.
- What appears to be a climbing attrition rate among engineering students—fewer per hundred enrollees actually getting degrees in engineering.
- A resultant forthcoming gap in the engineering work force that

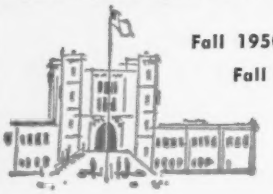


Engineering Enrollment in all Categories: 1950-1959

	UNDERGRADUATE		MASTER'S[1]		DOCTORATE		TOTAL	
	Number	Change from past year by percent	Number	Change from past year by percent	Number	Change from past year by percent	Number	Change from past year by percent
1959	242,992	−5.4	29,713	+5.6	5,643	+18.5	278,348	−3.9
1958	256,779	−4.5	28,138	+16.6	4,763	+13.9	289,680	−2.5
1957	268,761	+7.0	24,136	+7.0	4,180	+22.9	297,077	+7.2
1956	251,121	+13.4	22,529	+20.0	3,402	+7.6	277,052	+13.8
1955	221,448	+14.3	18,779	+7.7	3,163	−3.6	243,390	+13.5
1954	193,692	+12.8	17,441	−6.3	3,281	+9.3	214,414	+10.9
1953	171,725	+10.0	18,607	+6.1	3,001	+2.4	193,333	+9.5
1952	156,080	+6.9	17,539	+4.6	2,930	+1.9	176,549	+6.6
1951	145,997	−9.7	16,765	+5.6	2,875	+2.6	165,367	−8.1
1950	161,592	−20.0	15,869	+4.1	2,801	+10.1	180,262	−18.0

[1] Includes also enrollment for the postgraduate predoctoral degree of engineer.

Engineering enrollment in U.S. colleges:



Fall 1950-Fall 1959

Fall	Total		Number enrolled for—		
	Number	Percent change from previous year	First level degree[1]	Master's degree	Doctor's degree
1	2	3	4	5	6
1959..	278,348	—3.9	242,992	29,713	5,643
1958..	289,680	—2.5	256,779	28,138	4,763
1957..	297,077	+7.2	268,761	24,136	4,180
1956..	277,052	+13.8	251,121	22,529	3,402
1955..	243,390	+13.5	221,448	18,779	3,163
1954..	214,414	+10.9	193,692	17,441	3,281
1953..	193,333	+9.5	171,725	18,607	3,001
1952..	176,549	+6.6	156,080	17,539	2,930
1951..	165,637	—8.1	145,997	16,765	2,875
1950..	180,262	—18.0	161,592	15,869	2,801

[1] The first-level degree is the bachelor's or first-professional degree.

Estimated retention of undergraduate engineering students: Fall 1951-Fall 1959

Fall	2d-yr. enrollment as percent of freshmen of previous year	3d-yr. enrollment as percent of 2d-yr. of previous year	4th-yr. enrollment as percent of 3d-yr. of previous year	1st level degrees as percent of—	
				Seniors[1] at beginning of school year	Freshmen[2] 3 years earlier
1	2	3	4	5	6
1959..	68.5	81.8	91.5	.....	.....
1958..	67.9	83.6	91.8	86.0	52.4
1957..	72.7	86.8	95.5	83.4	53.9
1956..	76.6	87.7	95.4	84.6	51.6
1955..	77.6	89.3	96.8	85.2	51.0
1954..	72.9	87.3	95.4	88.8	57.1
1953..	71.8	88.7	96.6	92.3	64.8
1952..	76.4	93.5	94.3	91.5	57.7
1951..	78.0	89.1	89.2	98.1	.....

[1] Includes students (except part-time and evening students) normally expected to earn a first-level degree in engineering by the end of the academic year.
[2] Part-time and evening freshmen not included.

NOTE: The chart "Changes in the Number of Workers" was reproduced from U. S. Department of Labor publication *MANPOWER—Challenge of the 1960's.* Statistics in other charts were obtained from U.S. Department of Health, Education and Welfare publication *Engineering Enrollments and Degrees, 1959.*

will fall in the most productive age groups of the total labor force.

Taken one at a time and with a bit of background, there is considerable doubt about just how dire the circumstances are surrounding the current engineering enrollment picture, as well as the effect they will actually have on the engineering profession and the total labor picture.

First is the decline in enrollment. There are a number of factors which bear on this, and tend to alleviate the seemingly grim implications that bare statistics offer. Most basic of these is the predicted upward trend over the long haul. But even discounting this, current figures deserve closer scrutiny.

For instance, taking the statistics at face value, the 11.1 per cent drop in 1958 was followed by a 3.3 per cent drop in 1959, and an even more gradual decline last fall. There would seem to be an obvious tendency to smooth out, holding a level of enrollments clearly above that of 1954. Further, there are a number of factors not accounted for in the statistics. Many would-be engineering students have been sidetracked by the more "glamorous" aspects of other related scientific fields—physics, chemistry, astronautics. These students could conceivably transfer into engineering later in their academic careers. And even if they do not, they would not be totally lost to the Nation's technological efforts.

Another item not often considered is an outgrowth of the changing engineering curricula at many schools. With engineers given a broader base of scientific studies in their early college years, it is often as late as their sophomore or junior enrollment when they finally appear on the rolls as engineering students. The obvious result is a tendency to under report the actual number of engineers.

One more item is the growing trend to use junior colleges as a part of higher education. While many future engineers may spend their first college years in junior colleges, they are not statistically carried as engineers because they are not enrolled in accredited engineering colleges.

While none of the foregoing would be startlingly significant in isolation, they are perhaps worth a second look when taken together. And at the same time, all of these negative factors become positive when it comes to hand out degrees. Thus, in spite of lower freshmen engineering enrollments, graduate engineering classes appear likely to be able to hold their own in the future. The same would seem to hold true for first level engineering degrees, thus offsetting the seemingly stark enrollment figures.

Consider the National average on freshmen graduating at the end of four years; barely half of the number of freshmen enrolled ever made it. Second, compare the 1958 figures with those of 1955—when only 51 out of each 100 engineering enrollees ever graduated. Third, there are many schools using a five-year degree program, rather than the standard four-year curriculum. Finally, consider that the attrition rates now available do not necessarily reflect the 11.1 per cent drop class that created such furor in 1958.

While it may not be proven that the quality of engineering students fell off with the enrollment, neither has it been disproven. Nor is it likely to be for another few years.

With a bit of the edge taken off the blade, there is a better than fair chance that it can be handled safely. With the possibility that there will be a higher quality of engineering available, it would certainly seem to follow that the engineer in business—be it government or private—could be used more effectively in his job. And that the heavy influx of young workers anticipated over the next few years could be used to take over many of the routine jobs now performed by engineers in spite of their ability to handle more creative work well.

All in all, the engineering picture is probably not as bad as it has been made out to be by a number of people. With a long term trend to more engineering enrollees and graduates, there would seem to be less reason for the alarm that has been raised in the recent past.—**End.**

Professional Profiles

Hanen Harris Williams, P.E., is one of Arizona's greater contributions to the engineering profession. He has left his trademark, a well engineered job, on most portions of the western hemisphere.

FROM Ohio to the Philippine Islands, and from Miami, Florida to New Guinea—there are few climates or parts of the world in which Hanen Harris Williams, P.E., has not worked—and done the job at hand well.

Recently named Professional Engineer of the Month by the Central Chapter, Arizona Society of Professional Engineers, Williams added one more to his long list of honors, awards and testimonials as a top flight professional engineer.

Among the more significant honors: a Bronze Star for his work in the Philippines during World War II; past president of the Arizona Section of the American Society of Civil Engineers; and state director of NSPE.

Registered as both a civil engineer and land surveyor in New Mexico, Williams holds both of these certificates and structural and highway engineer registration in Arizona, his present home state.

In his full and challenging career, Williams has a hand in just about every kind of engineering he is qualified to do—from airports in Colorado to submarine bases in Subic Bay, P. I. He has had engineering responsibilities for work on runways, flood protection facilities, railroads, water supply facilities and general surveying.

He has worked for such diverse organizations as the Navy, Arizona Highway Department, U. S. Park Service and the U. S. Indian Service.

Most recently, Williams has been in business for himself, forming, and then taking as a partner James F. Ellis, Jr. in the firm of Williams and Ellis.

During his Navy career, Williams progressed from Lieutenant (jg) to Lieutenant Commander in the Civil Engineer Corps. He is still active in the Naval Reserve. He has held office at one time or another in many of the engineering societies, and takes an active part in community activities.

Born on April 11, 1908, in Steubenville, Ohio, Williams moved to Arizona in 1916. There, he studied at Phoenix Junior College and the University of Arizona, then moved to the University of New Mexico, where he received a bachelor of science degree in civil engineering.

Among his many nonprofessional activities, Williams is on the Camp Development Committee (Camp Geronimo), Roosevelt Council, Boy Scouts of America; a charter member and past officer in the RONS Club; the Parent Teacher's Association at Long Elementary School; and—in line with his profession—he was a 1960 member of the Building Advisory Committee at Cartwright School in Phoenix.—**End.**

Noah E. Hull
1960-61 NSPE
President

The Model Law for Professional Engineers

A Discussion by the President of NSPE

It is indeed important, I think, for me to discuss briefly the 1960 Model Engineering Registration Law in this AMERICAN ENGINEER article. This is a subject of extreme importance to all members of the engineering profession, and to our Society especially, as registration is the basis of our membership qualifications. The subject of the Model Law is particularly pertinent for consideration at this time because it was in Portland, Oregon, only a few months ago, that the National Council of State Boards of Engineering Examiners adopted the 1960 revision. Also, the Board of Directors of NSPE, meeting in Denver last October, endorsed the Model Law as approved and adopted by the NCSBEE.

I would be the first to agree that the 1960 Model Law is not a perfect document in all respects. However, it does represent and reflect the most modern, up-to-date, and practical thinking of numerous individuals and groups well versed in the subject of engineering registration. It has been reviewed by several eminent and experienced lawyers from different parts of the United States. It is offered as a sound and realistic approach for the revision of existing state registration laws in order to provide greater uniformity of qualifications for registration, and to raise these qualifications to a higher level of competence. Finally, it does represent a compromise of the divergent views and suggestions from a number of quarters, all of which are united in the primary purpose, that of developing a Model Law which is responsive to the need for safeguarding public health, life and property, and which, also, will serve to improve the stature of the engineering profession and thus help raise the profession to the position which it so rightfully deserves.

In discussing this Model Law, or any other model law for that matter, it must be clearly understood and appreciated, that the latest revision, as have others before it, is intended to be used as a guide. It is a reference work to be used as an aid in the preparation of amendments to existing registration laws, and to modify and improve existing regulations. As a guide, the Model Law is designed to provide a foundation upon which the supporters of new legislation can stand, in the knowledge that their position has the backing of the members of the various state engineering registration boards. For this reason, I believe that we should look upon the Model Law as a desired goal, but not something that every state may wish to accomplish through legislative channels. In using the Model Law it can be, should be, and undoubtedly will be, modified in each state to reflect local conditions, and the thinking of the local engineers and legislators.

Before turning to a discussion of the major changes in the 1960 revision, I think it would be well to briefly mention something of the history of the law. The first engineering registration law was adopted by the State of Wyoming in 1907. This was done as a result of some bad and expensive experience with dams built in that area with faulty engineering design. The years since then have witnessed the enactment of registration laws by all of the states, and coverage extended to the District of Columbia, the Canal Zone, and Puerto Rico. During the early stages of interest in registration, a need was recognized for a guide to

the basic principles which should be included in such a regulatory procedure, which is, as you know, based on the police powers of the individual states to protect the public.

Four years after the first registration law was passed in Wyoming, the American Society of Civil Engineers, in 1911, drafted the first Model Law, which was subsequently revised in 1925 and 1927. The 1929 draft initiated a new era of cooperative effort among the major engineering societies, who sponsored continuing studies and joint conferences on the subject. Out of this joint effort came a 1932 resolution which recommended the adoption of the Model Law by all engineering organizations. The result was the beginning of the present Model Law, which has served as a guide through the years. Further revisions were made in 1937 and in 1943, the latter including for the first time provisions for engineer-in-training certification. The most recent change, prior to this 1960 version, was made in 1946 and was largely confined to improving the definitions of "professional engineer," and "practice of engineering." The law has been under continuing study by various groups since that time, finally culminating in the version which was adopted by NCSBEE in Portland last August, and endorsed by NSPE this October.

Up-to-date and well formulated registration laws are necessary not only to protect the interests of the active profession, but also to assure new aspirants of a more sound future.

What significant changes have been made in this 1960 Model Law? I would say without hesitation that the most controversial change concerns section 22 (d), which is the section dealing with the practice of engineering by individual registered professional engineers through a partnership, joint stock company, or corporation, as agents, employees, officers, or partners. Section 22 is the section of the Model Law covering exemptions. Some of you may be familiar with this section but for the benefit of those who have not seen the latest copy, I would like to quote this section 22 (d).

> **22. (d) This act shall not be construed to prevent or affect corporate and partnership obligations.**
>
> **The practice or offer to practice engineering, as defined by this act, by individual registered professional engineers, through a partnership, joint stock company, or corporation, as agents, employees, officers, or partners, provided they shall be individually liable for their professional acts, and further provided that all personnel of such partnership, joint stock company, or corporation, who act in its behalf as engineers in the state are registered under this act or are persons practicing lawfully or are exempt under paragraph (b) or (c) of this section. Each such partnership, joint stock company, or corporation providing engineering services shall be jointly and severally liable with such individual engineers, and all final plans, designs, drawings, specifications and reports, involving engineering judgment and discretion, when issued, shall be dated and bear the seals and signatures of the engineers who prepared them.**

As you know, the question of corporate practice has been raging in several parts of the country for some time, and has been in and out of the Model Law over the years. The Model Law which was in effect in 1935 provided that corporations could engage in the practice of professional engineering "only provided such practice was carried on by professional engineers registered in this state." This language was eliminated in a later edition and no reference was thereafter made to what we may choose to call corporate practice.

The Model Law is intended to be a guide by which states may pass registration laws that are most consistant with the needs and best interests of the profession.

I certainly do not want to take the time to go into a long discussion of the pro and con arguments about corporate practice. Suffice it to say that section 22 (d) represents a compromise between opposing camps, and attempts to reconcile the different views which were proposed for assuring the protection of the public interest, while at the same time authorizing the practice of engineering through corporate form. However, I should add at this point that today 44 states permit corporate practice, either by explicit provisions in state law, or by interpretations of the law rendered by registration

Copies of the Model Law

Copies of the complete *Model Law for Professional Engineers and Land Surveyors* may be obtained at the cost of ten cents each from the National Society of Professional Engineers, 2029 K Street N.W., Washington 6, D.C.

boards, attorneys general, or judicial bodies.

The intent of section 22 (d), simply stated, is to permit individually registered engineers to practice engineering through a corporation, provided the individuals are liable for their professional acts, jointly and severally with the corporation. The section further provides that all personnel of the corporation who act on its behalf as engineers must be registered under the state registration act. There is one further restriction in that section 22 (d) requires that all final plans, designs, drawings, specifications and reports, involving engineering judgment and discretion, shall be signed and sealed by the registered engineers who prepared them.

In its deliberations on this troublesome section, the NCSBEE committee rejected proposals which would require that a majority of the stockholders be registered engineers, or that a majority of the directors and officers be registered engineers. The committee also rejected the suggestion that the Model Law be worded to require the engineer in responsible charge to be licensed and sign all plans and drawings, because this arrangement would permit an organization to have one registered engineer only, who could approve all engineering work done by non-registered employees. Rather, as I have mentioned, the Model Law calls for registration for all persons preparing drawings, reports, and specifications which involve engineering judgment.

I should add that this provision is intended to apply to corporations in the manufacturing and construction end of engineering, as well as to those corporations providing consulting services.

Another major change made by the 1960 edition is that the former so called "eminence" clause has been eliminated. You will recall that eminence clauses usually permit engineers above a certain minimum age, with extensive experience, to become licensed without examination on the basis of their record. In the 1960 Model Law, however, it is provided that an applicant with a record of at least twenty years of lawful practice in engineering work, ten years of which have been in responsible charge, may become registered if his experience is satisfactory to the board, and if he passes successfully a written examination on the principles and practices of engineering. An eight-hour written examination in engineering fundamentals, which would be required of most other applicants, is waived for those engineers with records of long established practice.

The thinking behind this change is that the registration laws have been in effect long enough, at the present time, so that there is little or no excuse for qualified men of long established practice not to have become licensed under existing laws. It is felt that if a man has worked in an exempt classification for years, and upon retirement wishes to enter practice requiring licensing, he is certainly not due any preferential treatment, as he has often received in the past.

However, some states may feel differently on the question of eminence registration, and if so, as I said in the beginning, each state must tailor its law to suit their own conditions, and there is nothing to prevent them from including such a provision in their own law.

In general, the 1960 Model Law raises the qualifications for registration by requiring a written examination for all applicants, except in cases of reciprocity. Other changes include stronger provisions for enforcement; a requirement that engineering employees of interstate and other public utilities be registered in the state of their residence if practicing in other states; and a clarification of the status of federally employed engineers, to establish that exempted engineering practice for the federal government will not waive compliance with the higher standards for qualification for registration at a later time.

In considering this Model Law we should not be too critical of it as a model law. As I have indicated, it is a compromise, and as you can appreciate, there are probably as many ways of drafting language as there are individuals or committees engaged in its preparation. Likewise it is not possible to satisfy everyone as to particular points of substance.

All in all, I would say that, while the 1960 edition of the Model Law is perhaps not the most perfect document that could be drafted, it does improve upon the previous version, and provides an opportunity for achieving a greater degree of uniformity among the states. Furthermore, it tightens up somewhat on the qualifications and requirements for registration and thus will, I believe, effectively serve to raise the stature of the registered professional engineers. **—End.**

Recent AE Reprints Available

The following reprints of recently published articles are available at 25¢ per copy. Write American Engineer, 2029 K St. N. W., Wash. 6, D. C.

The Civil Engineer: The Space Age's Forgotten Man?—August, 1960
By Samuel C. Florman, P. E.
Vice president, Kreisler-Borg Construction Co.
White Plains, N.Y.

JETS Award Winner Tours Washington—August, 1960
AE Photo Story

The P.E. at Parke-Davis—September, 1960
By Frederick A. Deiter, P.E.
Superintendent of Plant Engineering
Parke-Davis & Company

Depreciation and the Engineer—A Missed Opportunity?—September, 1960
By Maurice E. Peloubet, C.P.A.
Pogson, Peloubet & Co.
New York, N.Y.

Professional Engineers Must Do Iowa Engineering

The nonlicensed superintendent of the Corning, Iowa, municipal light and water plants has appealed a court decision ordering him to cease performing any services which could be classified as the practice of professional engineering under the Iowa Engineering Registration Act. The court order limited his services to the performance of duties as superintendent "in the operation and maintenance of the plants under his supervision and control, or in supervising minor improvements within the generating plant or distribution lines under his supervision." The Iowa Engineering Society intervened in the case as a "friend of the court."

The case arose when the trustees of the Corning Municipal Utilities ordered plans and specifications to be prepared for an electrical substation which cost approximately $102,000. The defendant superintendent also supervised the construction, and it was under his inspection, general supervision and advice that the work was finally accepted.

In the course of its opinion, the court referred to the Iowa Act which defines the practice of professional engineering as including "designing or responsible supervision of construction in connection with public works . . . wherein the public welfare, or the safeguarding of life, health or property is or may be concerned or involved, when such professional service requires the application of engineering principles and data." In light of this definition, the court ruled that the making of the plans and specifications and the supervision of the construction of the substation, were professional engineering.

The court acknowledged that a superintendent of a municipally owned utility plant is not required to be a registered engineer in order "to lay out minor improvements within the generating plant which is under his responsibility." But the court added, however, "to build a substation costing $102,000 is a different proposition."

The court declared that "it seems the superintendent of the plants would be limited to the operation and maintenance of the power and mechanical plant and would not be authorized to supervise the construction of a $102,000 substation improvement." *(Iowa v. Rhodes,* No. 9653, Adams County District Court, Iowa)

DC Court Says Television Technicians Not Engineers

The D. C. Municipal Court of Appeals has upheld a conviction and $60 fine against a television repair firm for violating the District of Columbia Professional Engineers' Registration Act. The firm used the name "T.V. Engineers, Inc." and displayed similar signs on its place of business, on its trucks, in newspaper advertisements and in telephone directory listings. Neither the president nor any of its employees, whom the court described as "television technicians," is a professional engineer.

The D. C. Statute makes it a misdemeanor for anyone to ". . . by verbal claim, sign, letterhead, card, or in any other way represent himself to be a professional engineer or through the use of any title including the word 'engineer' or words of like import, or any other title, imply that he is a professional engineer without being registered as provided in this chapter . . . ."

The defendant firm argued on appeal that as a corporation it cannot be guilty of a violation of the Act, because under the authority of a previous D. C. court decision, only a natural person may be registered. From this, the defendant claimed that only a natural person may be guilty of violating the Act. "We cannot accept this reasoning," the court said. "To do so would permit individuals to avoid the penalties of posing as professional engineers by the relatively simple act of incorporation. Although a corporation may not register under the Act, it may violate a provision of the Act. . . ."

The T.V. firm also claimed that its corporate name did not imply that it was a professional engineering firm and that the District had to show that it used the expression "professional engineer" before it could be found guilty. To this allegation, the court replied that the trial court had found otherwise, and "we see no reason for setting it aside." The court added that "all the statute demands is proof that the term 'engineer' was used."

The court admitted that the firm did not practice professional engineering, but said that the firm nevertheless implied that it offered professional television engineering service. A roster of the D. C. Registration Board showed that there is a class of professional engineering known as "Electrical/Radio Television," the court said. "We believe the trial court was justified in finding that the title, T.V. Engineers, Inc., implied a professional competence in that field." *(T.V. Engineers, Inc* v. *District of Columbia,* No. 2616, Municipal Court of Appeals for the District of Columbia, January 11, 1961)

New Literature

PRESSURE PIPE—A new, revised edition of Johns-Manville's "Installation Guide for Transite Pressure Pipe" has been published and is available to users of the product. The guide covers the handling and installation of transite pipe, from loading and unloading through all necessary operations such as assembly of pipe and couplings, cutting and machining, design of thrust locks, service connections, backfilling and tamping, testing, and many other on-the-job practices. It also contains data covering site conditions, soil and many other important considerations of interest to the engineer. The book contains 124 pages, and includes considerable tabular data plus numerous illustrations. A complete index to its contents is incorporated in the useful pocket-sized guide.

(Circle 15 in Readers' Service Dept.)

HOW-TO BOOK—A new book which describes the "how-to's" for successful product design has just been published by Odin Press. It's "The Finn Magnus Story"—and it's an account of how Finn Magnus, the eminent inventor-industrialist, developed the principles of product design that helped him create more than 42 successful mass production items, and found two new multi-million-dollar industries. In straight-forward language, this new profusely illustrated book, by Mack Hunter, explains the Magnus principles of product design in detail, demonstrates them with actual case studies.

(Circle 16 in Readers' Service Dept.)

POWER TRANSMISSION — The "Power Transmission Design Directory" the first directory and handbook covering power transmission products and related components, has just been published by *Power Transmission Design* magazine. The hard cover, 700 page volume has been edited for engineers and buyers whose responsibilities include design, specification and maintenance of power transmission products. The book is divided into six sections: the first, a directory of power transmission products lists products under major headings, subdivided and cross referenced: a trade names' directory which includes an alphabetical listing of the trade names, the products they identify, and names and addresses of their manufacturers. A manufacturers' catalog section: a section containing engineering reference material showing product, material and component applications and developments, case studies of successful power transmission designs, standards, techniques and ideas: and a "Yellow Page" section listing all lines carried, and services offered by distributors, dealers and jobbers.

(Circle 17 in Readers' Service Dept.)

BUILT-UP ROOFING — Complete specifications for constructing a built-up water-tight roof are contained in the just published 1961 edition of

"Koppers Built-Up Roofing Specification Manual for Architects and Engineers." The 28-page brochure includes instructions on materials and methods for installations on both flat decks and steep roofs and on all types of surfaces. Re-roofing, insulation, flashings, waterproofing and dampproofing are also covered. Specifications describe conditioning of the surface, step-by-step application of the roofing materials, preparation of materials and bonding conditions. The booklet is attractively styled, and all pages have been newly designed for easier reference and convenient use.

(Circle 18 in Readers' Service Dept.)

PIPING TIME—To help all chemical engineers reduce piping engineering time, the M. W. Kellogg Company has just completed a new printing of "Pressure Drop For Flow of Fluids in Round Pipe" by Leo Friend and Leon Samioloff. The 160-page volume, a compilation of detailed pressure drop charts, is a practical tool to help reduce engineering time required in accurately sizing and designing process piping systems. Minimizing manual computations, the charts in the volume present ready solutions to pressure drop relationships for both liquids and gases as a function of the variables specified by the commonly known Fanning equation. Each chart is plotted to give, at constant fluid viscosity, pressure drop as a function of rate flow with lines of constant diameter. The diameters chosen are those corresponding to the standard pipe sizes established by the A. S. A. Similarly the units of measure are those commonly used in the industry.

(Circle 19 in Readers' Service Dept.)

HEATING AND COOLING—Dean Products, Inc., has published a new binder-type brochure for specifiers and installers describing their Snopan and Colplate for refrigeration and their Steempan and Panelcoil for warming. Designed to fit into a three-ring binder or a standard file, the brochure pictures each of the four products and describes common usages, as well as the several available forms of each.

(Circle 20 in Readers' Service Dept.)

INSTRUMENT—The Beckman Zeromatic pH Meter, a line operated, drift free instrument for making precise pH or millivolt measurements, is described in a new bulletin published by the Scientific and Process Instruments Division of Beckman Instruments, Inc. The Zeromatic, designed for use in any laboratory where fast accurate pH measurements of liquids, pastes, or semi-solids are required, measures over full 0 to 14 pH range and offers direct millivolt reading to + or — 1400 mv. The instrument, featuring simply operated push button controls, also

incorporates a unique standby circuit which eliminates the need for warm-up between measurements. The standby circuit also disconnects the glass electrode from the input, preventing polarization of the electrode.

(Circle 21 in Readers' Service Dept.)

COLD BAR FURNACE—A full-color brochure describing the company's new continuous controlled atmosphere

furnace for heat treating cold-finished bars has been published by Jones & Laughlin Steel Corporation. The 4-page brochure explains how this furnace—and the exclusive Electreat process—provide a full range of heat treating processes for users of cold finished bars. Included are descriptions of the operation, new developments and cold finished bar products presently available.

(Circle 22 in Readers' Service Dept.)

FIBERGLASS CASES—has just been published by the Skydyne, Inc. This 16-page illustrated booklet includes drawings, photographs and specifications for hand-portable lightweight cases to house small equipment. This catalog features cases in 22 standard sizes with custom designed interiors to assure maximum protection for delicate optical, electrical and electronic equipment. Details cover not only standard cases, but modifications and custom cases as well. Also included are specifications for standard hardware, custom interiors and mounts, quality control. The catalog features a back-page pocket in which to file additional product and specifications sheets.

(Circle 23 in Readers' Service Dept.)

WALL SEALANT—"Preformed Sealants For Curtain Wall Construction," now available from Pawling Rubber Corporation, describes and illustrates the manufacturer's various synthetic rubber products for sealing, supporting, spacing and imparting resiliency to the glazing units employed in curtain wall construction. Specification, details and installation instructions are furnished for structural gaskets, which suspend panels free of the rigid structural framing members, and for both wet seal and dry seal compression gaskets, rubber extrusions which band the edges of the glazing panels. Also included is descriptive information about setting blocks and spacer shims for conventional glazing of low rise buildings and store fronts.

(Circle 24 in Readers' Service Dept.)

PRESS BRAKES—Over 360 drawings of standard and special press brake dies are contained in the 28 colorful pages of Valeron Corporation's new Press Brake Division's first catalog. The drawings are unusual in that they are outlined in black in the traditional manner, but all solid steel surfaces are shown through the use of metallic inks. In addition to listing the standard and special, single and multiple bend forming, blanking, notching and punching dies that will be manufactured at the new plant, the new catalog also contains tonnage requirements tables for both punching and bending various thicknesses of mild sheet steel. Complete engineering and design service, as well as try-out and reconditioning services are also offered.

(Circle 25 in Readers' Service Dept.)

RUBBER PIPE—General Rubber Corporation has just released their new bulletin 866 covering their recently acquired line of SoundZorber wire-reinforced flexible rubber pipe. These specially designed and constructed rubber pipes are made with the pipe walls of wire-reinforced, multiple plied rubber-impregnated fabric embedded in rubber for the full length of the pipe. The smaller pipe sizes (1" to 3") are available with either metal coupling fittings or with integral solid molded rubber flanges. Larger pipe sizes (4" to 12") are available with integral, solid, full-faced rubber flanges with either 150 lb. or 250 lb. drilling steel flanges embedded in the molded rubber flanges. Only the rubber flanges beat against the companion flanges of the piping system. In addition to dampening direct wall vibration, the SoundZorber, by its diaphragm "breathing" action, absorbs pulsations of the liquid column itself. It serves to reduce maintenance by effectively absorbing water hammer and its accompanying noise and vibration.

(Circle 26 in Readers' Service Dept.)

VIBRATION CONTROL—The Korfund Company, Inc. has just published two bulletins on vibration and shock control. The first features the Vibro-

isolator for efficient and economical control of vibration, shock and noise, and the second features other assorted pieces of equipment for the same type of function. Bulletins K3C and K4H, they describe the many uses and places where the equipment may be put to use, as well as giving points on the servicing and specifications.

(Circle 27 in Readers' Service Dept.)

These listings are informational only and are not an endorsement of the products, nor of the manufacturer's claims. To receive any of the new literature described in these columns, merely circle the item number in the Readers' Service Dept. and mail to AMERICAN ENGINEER.

Society News

Top Ten Public Works Men Include Six NSPE Members

The recently honored Top Ten Public Works Men-of-the-Year for 1960 included six NSPE members. Selected for their achievements in the field of public works and for adherence to the highest standards of professional conduct, each received an engraved plaque at a ceremony in his own community.

The NSPE members to receive this award were: Samuel S. Baxter, P.E., commissioner and chief engineer, Water Department, Philadelphia, Pa.; Lloyd D. Knapp, P.E., commissioner, Department of Public Works, Milwaukee, Wis.; Roy W. Morse, P.E., city engineer, Seattle, Wash.; Rear Admiral Eugene J. Peltier, P.E., chief, Bureau of Yards and Docks, U.S. Navy, Washington, D. C.; Glenn C. Richards, P.E., commissioner, Department of Public Works, Detroit, Mich.; and Bertram D. Tallamy, P.E., Federal highway administrator, U. S. Bureau of Public Roads, Washington, D. C.

Delaware Society

Four members of the Delaware Society are shown discussing details of a recent debate with Moderator Lee Robinson, center. The topic of discussion was a proposed plan for unification of the engineering profession. Held recently at the University and Whist Club of Wilmington, those who participated were (l to r) John T. Kephart and Clarence Evans for the affirmative, Moderator Robinson, and William J. Berry and J. Irwin Peters for the negative.

Illinois SPE Honors University Professor

A bronze plaque honoring the late Thomas C. Shedd, professor of structural engineering at the University of Illinois, was presented recently to the University by the Illinois Society of Professional Engineers at a luncheon on the Campus.

Professor Shedd, on the UI civil engineering faculty from 1922 until his retirement in 1958, died in July, 1959. Among his many activities he served as president and director of the National Council of State Boards of Engineering Examiners. In 1959 the Illinois Society presented him with the Illinois Award in recognition of these services.

Two identical plaques were prepared for the Civil Engineering Hall and the headquarters of the Illinois Society at Springfield.

Members of the Illinois Society, the UI Civil Engineering faculty, and friends of Professor Shedd attended the luncheon.

NSPE State Presidents' Conference Set for Purdue

The 1961 State Presidents' Conference of NSPE will be held April 13-15 in the Memorial Center on the Purdue University campus in West Lafayette, Indiana.

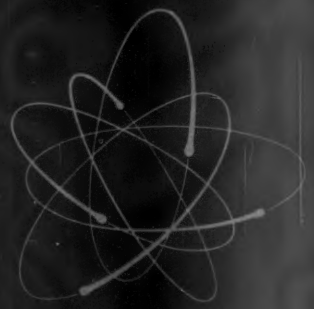
Opening with a dinner at the Union Club on Thursday, April 13, conference sessions will begin Thursday evening and continue through the next day. Regional luncheons are planned for Friday and dinner will be at the Lafayette Country Club that evening. The conference will conclude on Saturday with a general luncheon.

The annual conference is held to orient incoming state presidents with the broad scope of NSPE activities and to afford an exchange of ideas among groups having similar problems.

"Bring in one for SIXTY-ONE"

The NSPE Membership Committee urges each member to recruit one new member in 1961 in the active support of the Society's programs for the profession.

PROMOTIONAL AIDS FOR



NATIONAL ENGINEERS' WEEK

HERE are the basic promotional aids on which to build your Engineers' Week program. These items will give your program coverage in local newspapers, on radio and TV stations, and in civic and group displays. Use these promotional materials to emphasize the career opportunities in engineering.

1 ***TV Spot Films:*** A set of seven 20-second TV films dramatizing the theme of the 1961 National Engineers' Week. Produced to meet network standards, the films call attention to the career "doors" which are opened with an education in engineering and the physical sciences. Each film qualified for public service TV time during station breaks. A set of these seven films will reach your largest Engineers' Week audience. Price: Set of seven films, $25.

2 ***Set of Seven TV Slides:*** Obtain extensive TV coverage through the Week with these slides displaying poster-type art work and printed copy calling attention to engineering. May be used during all TV station breaks as public service announcements. Price: $10 per set of seven slides.

3 ***Tape Recorded Radio Announcements:*** A set of seven 20-second radio spot announcements, made by a network radio and TV announcer. Offers local stations a top-level recording for 20-second station breaks. Price: Set of seven recorded announcements, $3.50.

4 ***Lapel Buttons:*** A high-quality lapel badge with poster design. Each chapter or state society can set its own price for button sales. Prices: 100 to 500—15c each; 500 to 1,000—10c; 1,000 to 3,000—7c; 3,000 to 5,000—5c; and over 5,000—4c.

5 ***Posters:*** Colorful 9 x 11-inch pasteboard posters carrying the 1961 Engineers' Week design and theme. This is the basic promotional item for calling attention to the Week. Use on bulletin boards, in window displays, school exhibits, etc. Large size (18 x 22 inches) also available. Prices: 9 x 11, $4 per 100; 18 x 22, $5 per 100.

6 ***Paper Banners:*** Excellent for display use. Three feet long by 6 inches wide. Has poster design and words "National Engineers' Week" in color. Price: $4 per 100.

7 ***Bumper Stickers:*** Gummed paper stickers, 15 x 3¾-inch, carrying the words National Engineers' Week and a reproduction of the professional engineer's seal, in bright orange on a black background. Prices: 100 to 500—15c each; 500 to 1,000—10c; 1,000 to 3,000—7c; 3,000 to to 5,000—5c; and over 5,000—4c.

8 ***National Engineers' Week Seals:*** Use these brightly colored seals on all office mail from now through February 25. Poster design printed on 1½-inch gummed paper. Price: $3 per 1,000.

9 ***Newspaper mat story on the educational background needed for a career in engineering:*** A feature article stressing the importance of a well-ordered sequence of basic math courses throughout the four years of high school. Prepared on mat, with illustration, ready for immediate insertion in daily or weekly newspaper. Price: 75c each.

10 ***Newspaper mat story on the engineer in private practice:*** A feature article explaining what a consulting engineer does, what kind of background he needs, and how he must be registered as a professional engineer to sign plans and specifications. Prepared on mat, with illustration, ready for immediate insertion in daily or weekly newspaper. Price: 75c each.

11 ***Newspaper mat story on the engineer in industry:*** A feature article describing how engineers in industry utilize their professional knowledge and skill in research, development, and production. Prepared on mat, with illustration, ready for immediate insertion in daily or weekly newspaper. Price: 75c each.

12 ***Logotype:*** A metal cut of a poster design to insert in advertising, special sections of newspapers, industrial house organs, magazines, and other printed matter. All state society and chapter publications should have one. Price: $1 each.

13 ***"Engineering's Great Challenge . . . The 1960's:"*** A re-issue of the 15-minute tape recorded radio program distributed last year. Excellent for use on public service radio time. Price: $3 each.

USE THIS COUPON TO ORDER YOUR AIDS NOW!

1. ———TV spot films @ $25 per set.
2. ———TV slides: set of 7 slides @ $10 per set.
3. ———Recorded spot announcement @ $3.50 per set.
4. ———Lapel buttons: 100-500 @ 15c ea.; 500-1,000 @ 10c ea.; 1,000-3,000 @ 7c ea.; 3,000-5,000 @ 5c ea.; over 5,000 @ 4c ea.
5. ———Posters: regular size @ $4 per 100.
   ———Posters: large size @ $5 per 100.
6. ———Banners @ $4 per 100.
7. ———Bumper stickers: 100-500 @ 15c ea.; 500-1,000 @ 10c ea.; 1,000-3,000 @ 7c ea.; 3,000-5,000 @ 5c ea.; over 5,000 @ 4c ea.
8. ———Seals @ $3 per 1,000.
9. ———Newspaper mat stories on educational background for engineering @ 75c ea.
10. ———Newspaper mat stories on the engineer in private practice @ 75c ea.
11. ———Newspaper mat stories on the engineer in industry @ 75c ea.
12. ———Logotypes @ $1 ea.
13. ———Radio tapes: "Engineering's Great Challenge . . . The 1960's" @ $3 ea.

National Society of Professional Engineers
2029 K Street, N.W./Washington 6, D.C.

Sirs:
Please rush me items indicated. I enclose a check ☐ money order ☐ in the amount of $ _____
I understand remittance must accompany order.

NAME _____
(Please Print)
ADDRESS _____
CITY _____ STATE _____

New York Academy Honors Member's Aviation Treatise

At the recent annual dinner meeting of the New York Academy of Sciences, Isidor B. Laskowitz, P.E., member of the New York State SPE, was presented with the D.B. Steinman Award for his paper in the field of aviation research.

The award is given annually by the New York Academy to encourage research, development and writing in the subject of engineering sciences. The paper receiving the award is deemed the most acceptable original paper submitted from the membership of the Academy in the field of pure or applied research in structural engineering or aero dynamics, or as applied to the analysis and design of civil engineering structures.

Laskowitz's paper was entitled, "Vertical Take-Off and Landing (VTOL) Rotorless Aircraft with Inherent Stability."

Domeshek Receives Eleventh Patent Award

Sol Domeshek, Great Neck, N.Y., received his eleventh patent award from Captain Edw. C. Callahan, commanding officer and director, U.S. Naval Training Device Center, Port Washington, during award ceremonies held recently at the Center.

Mr. Domeshek

His latest patent was for the development of a stereo ranging attachment for a large transparency projector. The award has been offered to the Government on a royalty-free basis.

Head of the Visual Systems Branch at the Center, Mr. Domeshek is a registered professional New York State engineer, a member of NSPE, ASME, the American Society of Photogrammetry and the Optical Society of America. He is currently listed in the tenth Edition of "American Men in Science."

Louisiana Society

The Shreveport Section of the Louisiana Engineering Society recently installed officers for the coming year. Seen above (l to r) are Past President Orville Ice as he passes the gavel to the 1961 President, Tom Ruffin. Other new officers shown are Marion Bubenzer, first vice president, Frank Irland, second vice president, and Bill Ferguson, secretary-treasurer.

Talks on PECBI Report Set for Cincinnati Meeting

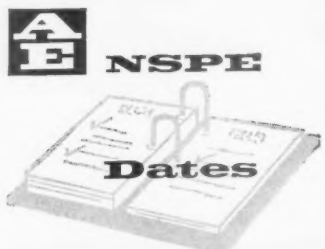
The Relations with Industry Division of the American Society for Engineering Education and the University of Cincinnati are sponsoring the thirteenth College–Industry Conference in Cincinnati, O., February 2-3.

The theme of the meeting will be "Professional Climate." Discussions and speeches will attempt to define the term as well as determine means for developing and maintaining it. Featured in a Friday, Feb. 3, morning session will be the recent NSPE sponsored survey "Engineering Professionalism in Industry," as reported by Hugh L. Rusch, vice president of the Opinion Research Corporation.

Paul H. Robbins, NSPE executive director, is an officer in the RWI Division of ASEE.

Harry N. Howe, P.E.

Harry Northrop Howe, P.E., died recently in Memphis, Tenn., where he had established himself as a leader in his profession. A structural engineer for almost 53 years, he had designed and supervised many of the buildings in downtown Memphis. A 1904 graduate of Cornell University, he was born in Fulton, N.Y.



to Remember

Iowa Society—Annual Meeting, February 8-9, Hotel Fort Des Moines, Des Moines, Iowa.

National Society of Professional Engineers—Winter Meeting, February 9-11, 1961, Hotel Fort Des Moines, Des Moines, Iowa.

Minnesota Society—Annual Meeting, February 22-24, Pick-Nicollet Hotel, Minneapolis, Minnesota.

Colorado Society—Annual Meeting, February 24-25, Denver Hilton Hotel, Denver, Colorado.

New Mexico Society—Annual Meeting, February 24-25, Santa Fe, New Mexico.

Kansas Engineering Society—Annual Meeting, February 24-25, Parrish Hotel, Great Bend, Kansas.

Tennessee Society—Annual Meeting, March 3-4, Andrew Johnson Hotel, Knoxville, Tennessee.

Ohio Society—Annual Meeting, March 16-18, Dayton-Biltmore Hotel, Dayton, Ohio.

Wisconsin Society—Annual Meeting, April 6-8, Loraine Hotel, Madison, Wisconsin.

NSPE State Presidents' Conference—April 13-15, Union Club, Memorial Center, Purdue University, West Lafayette, Indiana.

Florida Engineering Society—Annual Meeting, April 19-22, Angebilt and San Juan Hotels, Orlando, Florida.

Illinois Society—Annual Meeting, April 20-22, Pere Marquette Hotel, Peoria, Illinois.

National Society of Professional Engineers—Annual Meeting, July 4-7, 1961, Olympic Hotel, Seattle, Washington.

St. Louis Chapter Discusses The Value of Registration

"The Value of Registration" was the subject of a panel discussion, arranged by the St. Louis Chapter MSPE Young Engineers Committee, held at the Engineers' Club of St. Louis recently. The program was designed to inform all young engineers and engineering students in the St. Louis area of the importance of registration.

Members of the panel were George Schmidt, P.E., project distribution engineer, Union Electric Company; Shepard Ellis, P.E., consulting structural engineer; R. G. Calkins, P.E., group leader, Monsanto Chemical Company; and Rubin Feldman, P.E., head thermodynamics engineer, Emerson Electric Manufacturing Company. Panel Moderator was M. I. Loughin, a member of the Young Engineers' Committee of the St. Louis Chapter, MSPE.

Each member of the panel spoke briefly on the value of registration from a different point of view. Topics covered were the value of registration to the public, to the engineer, to the profession, and to the employer.

Mr. Schmidt opened the formal presentations by telling about the history of registration in the state of Missouri, the development of the registration law, how it is designed primarily to protect the public against unsafe engineering practices by incompetent persons, and by describing certain changes in the registration law that are expected to be presented to the Missouri Legislature in 1961.

In describing the value of registration to the individual engineer, Mr. Ellis said that failure to become registered was like going through four years of engineering school and then failing to show up at graduation exercises to receive the diploma earned. He said that engineers who properly prepare themselves, but fail to complete the job by becoming registered do not fulfill all of the requirements at their disposal for becoming a truly professional engineer.

Mr. Calkins said that the main benefit of registration to the employer comes about as a result of the self improvement activities of individual employees, one of the most important of which, for engineers, is following through on the requirements for registration. He said the company benefits when its employees improve themselves, achieving increased recognition from clients or customers. Registration is an important part of professional recognition in the engineering profession.

Mr. Feldman said that registration is important to the profession because it provides a standard by which those outside the profession can judge who is an engineer and who isn't. He said also that registration strengthens the engineering profession, and this is a benefit to all engineers individually.

Missouri Society

Colonel A. P. Rollins, Jr., Corps of Engineers, is seen here with Melford E. Monsees, president of the Western Chapter, MSPE (l), and Paul N. Doll, executive director of MSPE (r), at a recent dinner meeting of the Chapter where Col. Rollins spoke on "An Engineer's View of the Far East."

Oregon Society

Among those who attended the recently successful state convention of the Professional Engineers of Oregon were (l to r) James D. Caufield, 1960 president, Professional Engineers of Oregon; Darrel A. Riechel, 1961 president; Noah E. Hull, NSPE president; J. H. Stufflebean, NSPE vice president, Western Area, and William C. Hill, NSPE Director from Oregon.

In search of pictures . . .

ENGINEERS CLUB OF KANSAS CITY

. . . is attempting to complete a photograph file of past presidents. It would be appreciated if anyone having access to photographs of the following persons would contact W. G. Riddle, 1009 Baltimore St., Kansas City 5, Missouri:

D. Bontecou	(1913)	F. W. Fratt	(1916)
E. I. Farnsworth	(1914)	L. R. Ash	(1917)
J. W. Malcolmson	(1915)	Alfred Hurlburt	(1918)

Thoughts on Professionalism...

By PAUL H. ROBBINS, P.E.
NSPE Executive Director

Why Decreasing Engineering Enrollments?

ALTHOUGH total freshmen enrollments for 1960 have not yet been released, it appears fairly certain that while they will be higher than 1959, they will still be below the totals of previous years. Many are asking, "Why is this?" There is, of course, no single cause, but several unrelated incidents may serve to point up a part of the problem.

ONE of the more extensive methods of vocational guidance in high schools is a series of talks by well versed practitioners of the various professions and vocations. Recently at one of Washington's larger high schools, such a talk was given before an audience of several hundred. Several boys there commented that because they felt engineers did much repetitive work, they were more interested in science careers where the work would continually change.

A somewhat similar indication occurred at an Engineers' Week banquet of one of our chapters. Each year in this metropolitan area each engineer who wishes may act as a host to a high school senior who has chosen engineering or science as a career. The outstanding student of this group from each school, chosen for scholarship, potential and other factors, is awarded a slide rule. Of the 21 students thus honored, well over half gave as the specialty they planned to study not engineering, but a branch of science.

AND one final unrelated experience—In arranging for the details of one of the NSPE meetings recently, the young man assigned the responsibilities for coordinating convention arrangements for the hotel confided that he had been an A student in math and science in high school. The natural question was why he had not taken engineering in college. His reply, "I worked summers for a firm employing many engineers. Their work did not seem challenging, nor did I see where very many of them would get very far beyond where they were."

WHILE these are isolated examples and perhaps are not typical, they are illustrative of several things to which the profession must give attention.

FIRST—a better understanding of what an engineer does. The contribution of the engineer to the glamor fields and the real rewards of the constructive work of engineers in all fields need to be told in language that is meaningful to parents and students alike.

SECOND—a factual presentation needs to be made of the scholastic requirements for an engineering education. No one has ever claimed that an engineering education is one of the snap courses. But every profession, whether it be medicine, law, science, or engineering requires mental capacity, determination, dedication and some long hours of study. Engineering probably no more so than others.

THIRD—a better public image of the profession. This of course means a recognition of the contribution of the individual engineer by those who use his training and experience. It means, too, that each engineer must do all he can to conduct himself in such a manner that the young men looking at the profession will feel it is one to which they are willing to devote the necessary applications of scholarship and time to become a part of it.

SATURN

(Continued from page 26)

anything more than enlightened guesses and published military intelligence analyses of this schedule, the question of our heavy booster progress would appear to depend on the weight lifting totals as they are reported. In this competition, Russia holds a definite lead.

The Saturn booster firing schedule as of the first of this year called for one R&D launching during 1961, three in 1962, five in 1963, and one operational launching in 1964. None of the other boosters which NASA plans to launch during 1961 are capable of carrying heavier payloads than the Russians have already sent into orbit. The Saturn scheduled for launching this year will carry only dummy upper stages.

It would thus seem that even if the Russians do no more than stand still, we will not overtake them by much, if anything, in the field of achieving heavy space payloads from our boosters in 1961. Since it can hardly be imagined that the Soviet Union will not press forward with its heavy booster development in view of the political, military, propagandistic, and other advantages which it has harvested with Sputnik in the past several years, we are more or less forced to admit the validity of the almost inescapable conclusion: 1961 will not be the year when the gap is closed in heavy space payloads—under the present U.S. space program—whatever this may or may not mean in the over-all space exploration picture.

Concerning the heavy booster situation, the new Administration has in its files the recently released report to President Kennedy of the Ad Hoc Committee on Space. This report has particular significance for the future of U.S. space planning in view of the fact that the Committee was headed by Jerome B. Wiesner, who has been named Special Assistant to the President for Science and Technology. Dr. Wiesner, a graduate electrical engineer, and member of the MIT faculty, will doubtless be a key figure in advising the President on matters relating to the national space effort.

(Continued on page 53)

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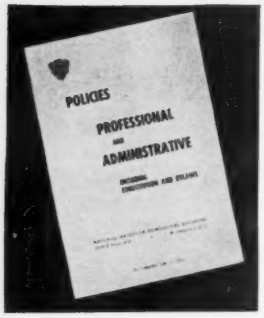

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By Mrs. Clark A. Dunn, Chairman, Ladies Auxiliary Advisory Committee.

From all parts of the country come compliments on the 1960 issue of *Engineers Wives*. "A very attractive publication," is the opinion of all.

A most interesting letter was received from the president of the Grand Valley Auxiliary of Lansing, Michigan. For the last four years this auxiliary has been active at Michigan State University. They have given several panel programs for wives of junior and senior engineering students. The panel consists of four women from the auxiliary and the topic usually discussed is, "How can a wife help her husband in an engineering profession?" The panelists are from different branches of engineering. The panel is followed by a question and answer period, which is always lively and shows a sincere desire on the part of engineering students' wives to help their husbands.

The subject discussed at the November meeting of the Professional Engineers Auxiliary of Weirton, West Virginia, was "Areo Space and Medicine." It was very interesting and informative.

Activities of the Lorain County, Ohio Society Auxiliary for the year include a tour of the Cleveland Electric Illuminating plant in Avon Lake. This auxiliary has an Education Guidance Committee which is doing an outstanding piece of work. After making a study of the needs from local science teachers and public libraries, they will purchase technical books for both the Lorain and Elyria libraries.

The Topeka, Kansas, Auxiliary gives two scholarships to engineering students at their state universities. They raise money for these scholarships in a number of ways, the most recent being a white elephant auction. At their first fall meeting, they had a most interesting program on "The First Ladies of Kansas." They have also had a covered dish dinner and a square dance demonstration.

The Mid-North Chapter Auxiliary of Stillwater, Oklahoma, held a registration coffee in the new home of one of the members. They were privileged to have as their guests, Mrs. Gomer Bittle, president of the Oklahoma State Auxiliary, and two other state officers, all from Oklahoma City.

NSPE News Briefs:

• Past President Harold A. Mosher, P.E., of Rochester, N.Y., was the featured speaker at the annual meeting of the **Louisiana Engineering Society** held recently in Baton Rouge. The theme of the meeting, "The Engineer—an Individual," was also followed by several speakers from industry. Part of the program included tours of the Dow Chemical Co. at Plaquemine, La., and the Willow Glen power station of the Gulf States Utilities Co.

• The Milwaukee chapter, **Wisconsin SPE**, recently announced nominations for 1961-62 officers which included James M. Phinney, P.E., for president, and Harry Gute, P.E., for state director.

• P. H. Robinson, P.E., member and past director of the San Jacinto Chapter, **Texas SPE**, was recently elected president of the Houston Chamber of Commerce.

• The **Missouri Society** recently took the lead in arranging a luncheon in Kansas City for the Missouri State Board of Registration for Architects, Engineers and Land Surveyors. The 36 in attendance represented 14 different organizations of the three professions. Chairman of the arrangements was Richard Stromer, P.E., of the Western Chapter, MSPE.

• George J. Nicastro, P.E., of the **Connecticut Society** has been made a member of the "Old Guard" of the American Society of Mechanical Engineers, an honor which grants him life membership and exemption from dues.

• Joseph J. Gershon, P.E., member of the **Illinois Society**, was recently elected president of the National Electronic Conference for 1961. His present position is director of the Resident School at De Fry Technical Institute in Chicago.

• The **Michigan Engineering Society** recently mailed checks for $250 to the Michigan Engineering Society and Affiliated Groups Student Loan Funds which have been established at four colleges and universities in the state. Various affiliates of the Michigan Society keep funds available at each engineering college for use when needed.

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(Continued from Page 48)

One of the Space Committee conclusions stated that:

"Development of the Saturn booster should continue to be prosecuted vigorously. However, it would be dangerous to rely on Saturn alone for the solution to our problems, either in the long or short term, for two reasons: (a) It is intrinsically so complex that there is a real question whether it can be made to function reliably; (b) It represents a maximum elaboration of present technology and provides no route to further development."

The Space Committee had other critical words for our space effort, including the view that "neither NASA as presently operated nor the fractionated military space program nor the long dormant space council have been adequate to meet the challenge that the Soviet thrust into space has posed to our military security and to our position of leadership in the world."

The Space Committee recognized that "the inability of our rockets to lift large payloads into space is the key to the serious limitations of our space program . . . and the rapid development of boosters with a greater weight-lifting capacity is a matter of national urgency." However, the Committee's report offers no specifics for solving the existing booster problem other than the observation that "it is important that we maintain and strengthen the concept of a National Booster Program."

The problem of professional personnel received this observation from the Committee: "In addition to the difficulties and delays which the program has endured because of the lack of sufficient planning and direction, it has also been handicapped because too few of the country's outstanding scientists and engineers have been deeply committed to the development and research programs in the space field. In changing the management structure and in selecting the administrators for the effort, the need to make space activities attractive to a larger group of competent scientists and engineers should be a guiding principle."

The visitor to the Saturn fabrication and testing areas at Huntsville

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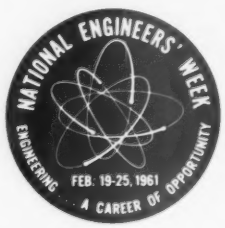
does not come away with any sense of having seen a project being rushed along at top speed. The pace of the work is about the same as in any in-house government R&D facility. The Saturn booster launching schedule, which will be limited to the carrying of dummy upper stages through this year and most of 1962, would seem to give the U.S. a built-in assurance that the heavy booster part of our program will remain a weak link in the space chain.

The new Administration's approach to the "national urgency" of the heavy booster situation will more than likely center around a considerable increase in the funding of projects like Saturn and the F-1 single chamber rocket engine with its 1.5 million pounds of thrust. This approach will certainly broaden the engineering career opportunities in space activities which are already many and varied. With the R&D facilities available in these large space projects, and the educational and professional development facilities open to engineers, it is clear that an engineering career in the exploration of space is indeed a career of opportunity.—**End**



REPORT

(Continued from page 31)

Further, the proposal states, "in the event a client is destitute and has a critical problem, the committee as a whole shall consult and decide the proper methods of handling same."

What constitutes a "critical problem" is decided by professional engineers—the committeemen, who have as heavy a stake in maintaining professional standards as any professional engineer.

The second basic goal of the Bureau has to do with civic functions. Actually, the task of the Bureau as "an organizing group for

the performance of certain public services meeting the needs of a general public nature" is fairly self-explanatory.

Under the proposed system from ISPE, this would include such functions as (1) staffing "blue ribbon" juries; (2) manning advisory committees to responsible public authorities; (3) taking part in various governmental investigating committees where engineering principles or malfeasance are in the spotlight; and (4) disaster planning or other public spirited duties.

As this goes to press the Chicago Bureau is well on its way to becoming a reality. All of the initial organization is out of the way, a phone number is listed for the Bureau, and by February 1, the Bureau should be doing its job on a full time basis.

To make itself known, the Bureau prepared a brochure that will be distributed to other associations in the Chicago area and various offices of the local government. Also, press releases, and news conferences will be used to give the Bureau the best possible start.

Given this good start, the program for building professionalism initiated by the Chicago Chapter could well provide a model for other similar organizations in urban areas throughout the country.

LETTERS

(Continued from page 10)

surance agency having jurisdiction. The fabrication drawings should definitely be reviewed by a registered professional engineer somewhere between the drafting board and the placing of the fire prevention system into use, and his approval indicated thereon. In fact, it would occur to me that a company like the "Automatic" Sprinkler Corp., would want to safeguard itself by this means. . . .

ELBERT J. LEUTY, P.E.
Marion, Ohio

On Jacob's Piece . . .

Dear Editor:

In response to the Jacob's piece in the December AE, I have a few comments to make. I believe . . . (1) Companies employ engineers primarily for their *creative* ability. (2) All engineers may not belong to the Society. (3) *Engineer* members of the Society

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do not have an equal voice in the Society's business. (4) Large company management policies do more toward stifling individual initiative than any union could or has; switching to another large company would therefore do no good. (5) An engineer is an individual academically trained to solve problems through prior knowledge, experience, and creative thinking. (6) Professionalism or individuality must be stressed in school. (7) The graduate engineer is not an engineer. (8) Engineers must be taught the invalidity of solving problems by analogy; each and every problem is different and unique. (9) Blessed is he who knows and more blessed is he who knows that he does not know. (10) To justify a salary increase, value must go up. (11) The engineer must strike a balance between the creative requirements of his job and the conformity required by society in the form of regulations, unions, and convention; this problem is solved every day by every engineer, at no increase in cost. (12) Because of the unpalatability of unions, the engineer is thrown in with the white collar worker who is not required to be creative. This is the devastating weakness in our "profession." An engineer may some day turn into a manager but it is impossible to make a silk purse out of a sow's ear.

To call an engineer a "human being in disguise" is really an insult. An engineer is a specialist, a valuable commodity whose actual value is proportional to his grade point average in college. An engineer can apply his methodology to business management problems with superiority, *if* his fire is kindled properly.

The question is, can or does a manager holding the money bags grant salary increases based on extracurricular activities such as clubs, professional society memberships, bowling scores, church attendance, dirty story telling ability, charity, political affiliation, or social grace? Let me answer that question: I think not. The only logical answer is that there must be increased value, indicated by knowledge or experience gained, not as a reward for past accomplishments.

GENE C. BURNS, P.E.
Jackson, Michigan

Educating P.E.'s . . .

Dear Editor:

The January issue of the AMERICAN ENGINEER contains an article entitled "At the Cross Roads of Engineering Education," written by Walter V. Medenica, P.E. It is indeed gratifying

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to find engineers outside of the educational field taking an active interest in this subject. The author makes certain statements which imply that present day engineering education is too generalized, that people including engineers and college graduates are likely to be unstable, that enrollment in engineering is decreasing and that one can produce expert designers in four years if only high schools could raise their standards considerably. The writer must take exception with these statements.

First let me say that it is impossible to produce an expert in any field until a firm foundation has been built in the necessary prerequisite courses. One cannot, for instance, be an expert structural engineer today without having first mastered certain fundamentals in mathematics beyond differential equations and of engineering mechanics beyond the usual undergraduate courses. Roughly two years of intensive study on a graduate level is necessary today to prepare a man for designs in which he will be equally at home with bar type structures, plates, shells, pneumatically stiffened structures, etc., and made of materials which may behave elastically, plastically, or visco-elastically. The structural engineer must know something of the effect of temperature and time on the stress-strain relationships of his material, of the atomic structure of matter, and of its influence on theories of failure. Materials which appear ductile in one environment can easily become brittle in another and the designer must be aware of such subtle changes in the responsiveness of the continuous medium he happens to be using.

The comments in the preceding paragraph have all dealt directly with the structural response of solids but these in turn are influenced by the environment in which the structure will operate. A good structural engineer would have to know something about the abrasive action of scouring in the field of fluid mechanics, and of aerodynamic theories in order to predict pressure distribution over shell like structures or of the aerodynamic response of stiffened roadways of suspension bridges.

The problem is even more complex

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than this for in order to be truly progressive a good structural designer will have to know something about thermodynamic theories of solids in order to understand the influence of damping coefficients as they affect vibration in his structures, and of electrical theory in order that he may understand and use electrical analogs in the solution of his problems when these are advantageous. He should also know something of electrical circuit theory in order to use electrical analog computers based on mathematical simulation as well as the high speed digital computers.

Even if high school graduates entered college with a firm foundation of calculus, it is doubtful that one could educate the kind of structural engineer described above in four years. Certainly if one did the man would be worthy of more than a bachelor's degree. The comments also indicate the impossibility of prescribing a very narrow course of studies in any field of specialization because all fields are tied together with higher mathematics and basic science in a very sophisticated way. To build the type of educational structure Mr. Medenica prescribes would be akin to constructing a pyramid resting on its apex. It would appear instead that it is far sounder to provide a broad base in the first four years in the necessary basic sciences, mathematics, the engineering sciences, and English in order that the student can spend his senior and several years of graduate study really probing some area in depth and becoming a real expert. Such an expert will be able to appreciate the interplay between other disciplines and his own specialty and will not neglect these to his own sorrow, as some of our early bridge designers did because they were unaware of aerodynamic theory.

Mr. Medenica also indicates that the percentage of college educated people among the mentally unstable is in proportion very high. I am rather surprised at this statement and have no statistics to refute it off hand but I can refer the author to recent issues of *Machine Design* (12-10-59, 12-24-59, and 1-7-60) in which Eugene Raudsepp surveyed the results of over 150 psychological tests made on groups of engineers, given by various institutes for many organizations. This reference is limited to engineers but I do believe that is what Mr. Medenica had reference to. Mr. Raudsepp indicated that "psychologists who delight in building a typical specimen, find engineers a predictable lot—a homogenous group demonstrating a narrow range of temperaments and the same personality traits. It is impossible, they say, to find such consistency in other professional groups." If both Mr. Raudsepp and Mr. Medenica are correct all engineers are unstable. For egotistical reasons I refuse to believe this and would guess that the reciprocal were more nearly true. If it is true one can only say that it takes all kinds of people to make the world and be glad he is not one of them.

The author also indicates that engineering enrollment did drop eleven per cent in 1958, and an additional three per cent in 1959. These figures are essentially correct but it should be noted that they did increase 3.6 per cent this last fall and so perhaps things are not quite as bad as they do seem. It is quite possible, however, that the quality is being raised much more rapidly than the actual number enrolled because of the insistence of most colleges today that individuals take and pass with a respectable score the College Entrance Board examination.

D. H. PLETTA, P.E.
Head, Dept. of Engineering Mechanics, Virginia Polytechnic Institute, Blacksburg, Virginia

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For Your Convenience . . .

AE's EXPANDED Readers' Service Department!

Now it is easier than ever for you to get information f-a-s-t on new products and services. The other side of this page when folded makes a *self-addressed reply envelope* that is all ready to come back to us. All you have to do to use it is to first read the advertisements, and the "Progress in Products" and "New Literature" features in every issue, noting that each makes specific reference to numbers on the form below.

Then if you want more information about any item, simply circle the corresponding number on the form, sign, fold, fasten and MAIL TODAY!

We do the rest. And within days, the data and literature you want is on its way to you.

Take advantage of this FREE service. Use this handy envelope NOW!

February, 1961

Please have information sent to me on items circled below:

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.....

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Company Name .....

Address .....

City ..... **Zone** ..... **State** .....

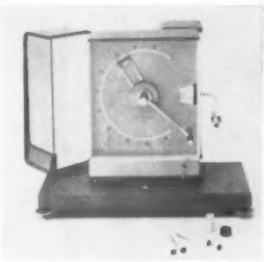
Progress in Products

TAPE-PEN HOLDER — Item 30

A new beam compass holder designed for use with the Chart-Pak precision "TAPE-PEN" is now available from Chart-Pak, Inc. This new aluminum pen reduces tedious work with pen and pencil by "drawing" precise circles and arcs with narrow width "Curve-Line" tapes. Adjustable for making circles of various sizes, it has radii of one to nine inches. If longer radii are desired, additional standard length beam sections may be coupled to the basic beam.

PRECISION BALANCE — Item 31

A new precision balance called the model L precision balance has been introduced by Federal Pacific Electric Co. for rapid precise weighings in the fields of research, production, quality control, and analytical work. The new balance double hook fills weighing needs in a range as low as 0-3 mg or as high as 0-50 grams. By means of its counterweighing ability, loads up to 3 times scale value can also be weighed.



JOINT SEALER — Item 32

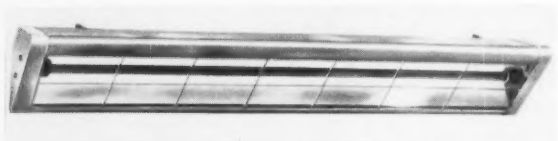
Sealfastic is a revolutionary pre-molded concrete joint sealer. Thoroughly waterproof, Sealfastic has 100% expansion recovery up to one inch. Sealfastic may be slipped into joints as thin as ⅛" sawn joints, straight or curved. There is no drip or spillage, so it may be placed exactly at any elevation in the joint. It will not ignite and is fuel resistant. Versatile in use, this low cost new sealer may be used in regular as well as sawn highway joints, for tilt-up, lift-slab and curtain wall construction, and swimming pools, reservoirs, etc. Sealfastic consists of one-inch bats of polyurethane foam, impregnated with a wide choice of types and colors of binders.

DOWNLIGHTING — Item 33

McPhilben's 82 and 84 lines are designed for exterior or interior downlighting. They feature all aluminum construction with hinged two-piece housings, completely gasketed and Underwriter's approved as enclosed and gasketed (vaportight). Choice of prismatic lenses or heavy cast carrara diffusers designed for use with 150 watt, medium base incandescent lamps. Satin anodized finish provides permanent non-corrosive finish. Simple to install, easy to maintain. Either round or square design can be used for lighting covered walkways, under canopies, shower-locker-game and all purpose rooms.

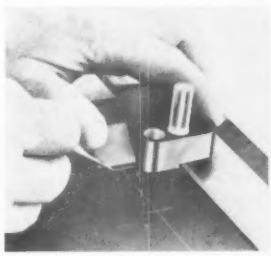
INDOOR-OUTDOOR HEATER — Item 34

A new line of infrared overhead spot heaters has just been introduced by the Berko Electric Mfg. Corp. Designated as Cat. No. VOH, the heaters feature a tubular element constructed of Corning's Vycor R silica glass, frosted inside and out. This remarkable material transmits more than 90% of the long (far) infrared waves generated by the coiled heavy duty alloy element sealed inside. The tube element has extremely high thermal shock characteristics which make it exceptionally suited for outdoor use and exposure to freezing rain, snow, etc.



PRECISION TOOLING — Item 35

Tool Components, Inc. has been appointed exclusive national distributor of the Scribe-Rite and Gem Center Scope precision centering and layout instruments for the metal working industry. The Gem Center Scope is close tolerance manufactured of unbreakable optical plastic and is accurate to .001" with 6.0 power magnification. It is used as a center finder for drilling precision holes, inspection and other tooling applications.



PORTABLE OUTLET REEL — Item 36

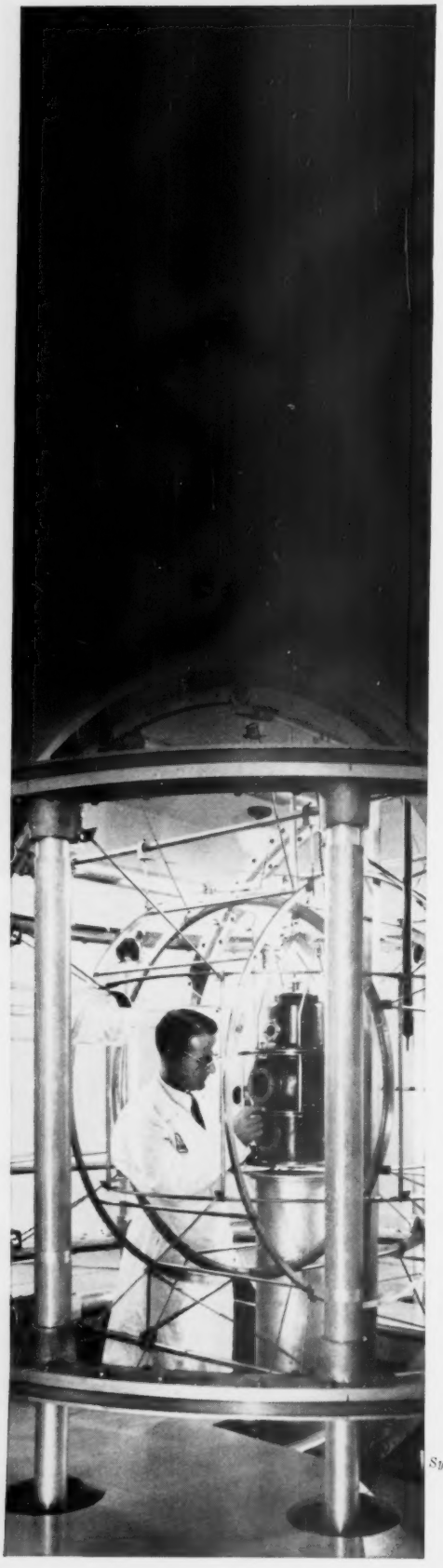
Cordomatic's Portable Outlet Reel, Model 600-PO provides 2-way outlets wherever needed in plant, shop, warehouse or office. Brings light and power to your work. Just plug in cord, carry portable outlet reel wherever you want to use it. Cord pulls out to any desired length up to 15', locks, automatically retracts into housing when not in use. Three-way outlet operates several tools, appliances or other electrical equipments from the same unit. Automatically retracting reel promotes safety and protects wiring, insuring long wear. Heavy duty spring motor is dust proof, lifetime lubricated with complete unit U. L. approved.

WHITEPRINTER — Item 37

Rotolite announces a new Whiteprinter with finger-tip controls and the fastest whiteprinting lamp on the market. The new dial speed control does away with gear changing. It makes sepias and foils as well as fast white prints. Its single new lamp gives it simplicity and the lowest upkeep cost of any. There is only one lamp to maintain and change. Both the printing unit and the transparent developing tube can be mounted on any office wall. It is easy for anyone to operate.

This feature describes new products of general interest to professional engineers. For further information, circle the item number in the Readers' Service Dept. and mail to AMERICAN ENGINEER.

These listings are informational and are not an endorsement of the products, nor of the manufacturer's claims.



System of Helmholtz coils used to neutralize earth's magnetic field.

Why we eliminated the earth's magnetic field . . . almost

In an isolated laboratory in southwestern Ohio, GM Research scientists have reduced the earth's magnetic field to one ten-thousandth of its usual strength. This is about as weak as the interplanetary field detected by the Pioneer V solar satellite.

Why neutralize the earth's field? To perform with precision one of the more fundamental experiments in magnetism —measuring the Einstein-DeHaas effect. The measurement is simple in concept, experimentally difficult because of the tiny forces involved. It is made by suspending a ferromagnetic rod in a nearly field-free environment . . . magnetizing the rod . . . then measuring the effect (how much the rod rotates) when this known magnetization is reversed.

The beauty of the experiment is that the resulting values can be related directly to the motions of electrons in the rod. The values indicate the large portion of magnetization due to the *spin* of electrons . . . and the slight, but theoretically important, remaining portion due to *orbital* motion of electrons.

These measured values are helping scientists form a better understanding of the perplexing phenomenon— ferromagnetism. Currently being pursued in cooperation with the Charles F. Kettering Foundation, this long-standing project is one of the ventures in basic research of the General Motors Research Laboratories.

General Motors

Gyromagnetic Ratios

	a	*b*
Iron	*1.92*	*1.90*
Cobalt	*1.85*	*1.83*
Nickel	*1.84*	*1.83*
Supermalloy	*1.91*	*1.91*

Comparison of (a) gyromagnetic ratios measured in the new Kettering Magnetics Laboratory with (b) corresponding ferromagnetic resonance measurements. These ratios would equal 2 if magnetization were due only to electron spin, or 1 if due only to orbital electron motion.

GM joins in the ENGINEERING WEEK salute to the many accomplishments of this great and vital profession.